Subpart B—Responsibilities Under Executive Order 10582

5. Subpart B is amended by adding an authority citation as set forth below and by removing the separate authority citations following all the sections in Subpart B:

Authority: 41 U.S.C. 10a *et seq.*; 29 U.S.C. 49 *et seq.*; 15 U.S.C. 644(n); E.O. 12073, E.O. 10582 as amended by E.O. 11051 and 12148.

Signed at Washington, DC, on June 14, 1988.

Ann McLaughlin,

Secretary of Labor.

[FR Doc. 88–13870 Filed 6–20–88; 8:45 am]

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Tuesday
June 21, 1988

Part IV

Department of Education

34 CFR Parts 350 and 360

National Institute on Disability and Rehabilitation Research; Final Regulations

DEPARTMENT OF EDUCATION

34 CFR Parts 350 and 360

National Institute on Disability and Rehabilitation Research

AGENCY: Department of Education.

ACTION: Final regulations.

SUMMARY: The Secretary amends the regulations governing the National Institute on Disability and Rehabilitation Research (NIDRR). These regulations implement the statutory requirement that NIDRR support projects for the training of rehabilitation researchers, as added by the Rehabilitation Act Amendments of 1986. These regulations define the purpose and required activities of the program, identify eligible applicants, and specify criteria by which applicants will be selected to receive awards.

EFFECTIVE DATE: These regulations take effect either 45 days after publication in the **Federal Register** or later if the Congress takes certain adjournments. If you want to know the effective date of these regulations, call or write the Department of Education contact person.

FOR FURTHER INFORMATION CONTACT: Betty Jo Berland, National Institute on Disability and Rehabilitation Research, 400 Maryland Avenue, SW., Washington, DC 20202. Telephone: (202) 732–1142; deaf or hearing impaired individuals may call (202) 732–1198 for TTY services.

SUPPLEMENTARY INFORMATION: The NIDRR, established under Title II of the Rehabilitation Act of 1973, carries out a variety of research and related activities. Title II was amended most recently in 1986. Regulations to implement most changes made by the Rehabilitation Act Amenmdments of 1986 were published in the **Federal Register** on August 12, 1987 at 52 FR 30060. The Secretary now amends the regulations to implement a new program authority for training in rehabilitation research under section 202(k) of the Rehabilitation Act, as added by Pub. L. 99–506, the Rehabilitation Act Amendments of 1986.

On the basis of an analysis of the need for expertise in particular rehabilitation research fields, the Secretary has determined that the appropriate implementation of this authority is to provide advanced training in research for individuals trained in rehabilitation-related clinical specialties whose professional practice degree requirements did not include an emphasis on research capability. This is typical in many fields of medicine and allied health specialties, social work, and similar applied disciplines. The research training that is currently provided, frequently through in-service training or occasional workshops, is not sufficient in duration or intensity. Thus, the Secretary is establishing a program that would require project grantees to provide training that is at least one year in duration. Additional training would be required if necessary to enable individual trainees to become qualified to conduct independent research.

The Secretary believes that evaluating applications for projects to train researchers differs significantly from evaluating applications for projects to conduct research, and thus the selection criteria for this program focus on four major components of an effective research training program. They are: The relevance and importance of the proposed training program and its probable contribution to increasing the population of qualified rehabilitation researchers; the quality of the proposed training program; the quality of the resources and the personnel involved in the project; and the plan for management and operation of the training program.

These selection criteria incorporate all of the elements specified as selection criteria in the Education Department General Administrative Regulations (EDGAR). However, these regulations consolidate those criteria into the four described categories.

On February 9, 1988, the Secretary published a notice of proposed rulemaking for NIDRR at 53 FR 3832. NIDRR received several comments and some changes have been made in response to those comments. An Analysis of Comments and Changes follows this paragraph. The principal changes from the proposed regulations are to change in § 360.40 the minimum two-year training period to a one year requirement, unless a longer training period is necessary to enable a trainee to become qualified to conduct independent research, and to adjust the weights for the selection criteria in § 360.31(a) and (d). However, these changes will not become effective until fiscal year 1989. The fiscal year 1988 competition for this program was announced under the Notice of Proposed Rulemaking, and the closing date for receipt of applications has passed. Thus, applications in fiscal year 1988 will be reviewed in accordance with proposed §§ 360.31(a), (d), and 360.40. Changes to these provisions are not being made effective for fiscal year 1988 because NIDRR would not have time to notify all applicants of the changes, allow them an extension of time to amend or resubmit their applications, and still make timely 1988 awards.

Analysis of Comments and Changes

NIDRR received several letters containing comments on the proposed rules. A discussion of comments and substantive changes follows.

Comment: One commenter recommended that the term "Director" be substituted for the term "Secretary" and the term "Institute" be substituted for "Department", since the Rehabilitation Act, as amended, clearly specifies that the Director of NIDRR is authorized to award grants.

Discussion: The Department of Education Organization Act authorizes the Secretary to exercise all functions of the Department and its constituent officials, including the promulgation of regulations. The Education Department General Administrative Regulations (EDGAR), in Part 77, defines "Secretary" to mean "the Secretary of The Department of Education or an official or employee of the Department acting for the Secretary under a delegation of authority."

Changes: None.

Comment: One commenter recommended that § 350.20 be revised to require that applicants submit applications to State rehabilitation agencies for the blind as well as to the State rehabilitation agency. Most States have two State rehabilitation agencies.

Discussion: The requirement in § 350.20 is based on provisions of the Rehabilitation Act. Section 204(c) of the Act mandates that the general grant and contract requirements of section 306 apply to all NIDRR financial assistance, unless the content of the requirement indicates that it is clearly inapplicable. For example, the construction requirements of section 306(b) would not apply because NIDRR does not support construction projects. One of the requirements that does apply to NIDRR is section 306(i), which requires that the appropriate State rehabilitation agency or agencies designated under section 101 be provided an opportunity to comment on proposed grants or contracts. Section 101(a)(1)(A) of the Act permits each State to designate a separate rehabilitation agency to provide services to the blind that is separate from the State agency providing services to all other disability groups.

Changes: A technical change has been made to § 350.20 to clarify that if a State has designated two rehabilitation agencies to provide services, then both agencies must be afforded the opportunity to comment on proposed NIDRR grants or contracts.

Comment: On commenter suggested that there be a change in the weighting of the selection criteria, arguing that the criterion, "Importance and potential contribution" is extremely significant and should be increased from 10 points to 20 points.

Discussion: The Secretary agrees that this is an important aspect of the program and should be given greater emphasis.

Changes: The weight accorded to the criterion, "Importance and potential contribution", has been increased to 20 points. The weight accorded to the criterion, "Management and operating plans", has been decreased, consequently, to 10 points.

Comment: Several commenters recommended that the requirement of a minimum training period of two years would discourage many potential trainees from participating in the program, and thus urged that a one year minimum be adopted.

Discussion: The Secretary agrees that the two year requirement could be a barrier to participation by individuals who have other career commitments. At the same time, the Secretary is concerned that a shorter training program may not be sufficient to prepare some individuals, depending on their prior academic and research backgrounds, to conduct independent research. Therefore, the Secretary is establishing, as a general rule, a minimum training period of only one academic year, but is requiring additional training if necessary to enable individual trainees to develop competence to conduct independent research.

Changes: The absolute requirement of a minimum two year training program has been changed to a minimum training period of one year, with an exception requiring longer training if needed by individual trainees.

Comment: Several commenters recommended that any priorities established in this program be based on survey data reflecting rehabilitation research manpower needs and be expressly consistent with the NIDRR long-range plan.

Discussion: The Secretary agrees that priorities should be based on some objectively identified needs for additional research expertise. However, there are no reliable sources of survey data for the entire field of rehabilitation research. In addition, NIDRR has other sources of information on needs, such as analyses of grant applications submitted to the Institute, conferences with professional associations, and input from established rehabilitation researches and from other Federal research agencies.

Changes: No changes have been made.

Comment: Several commenters recommended that the requirement in § 360.10 that training be provided to "* * * individuals who have clinical experience * * *" be broadened to include "* * * individuals who have clinical or other experience * * *"

Discussion: The Secretary agrees that rehabilitation research training should be available to individuals who lack clinical experience but have research experience in basic sciences or relevant management experience.

Changes. Section 360.10 has been revised to include individuals with relevant management or basic science research experience.

Comment: Several commenters recommended that the requirement for laboratory experience be deleted, since "laboratories" are not relevent to some fields of research.

Discussion: The Secretary believes that the concept of laboratory, or its equivalent in a community-based alternative research setting, applies in all areas of scientific inquiry. It is important that independent researches be able to conduct research in such settings.

Changes: Section 360.11 has been changed to expand the concept of laboratory experience to include equivalent experience in a community-based research setting.

Executive Order 12291

These regulations have been reviewed in accordance with Executive Order 12291. They are not classified as major because they do not meet the criteria for major regulations specified in the order.

Assessment of Educational Impact

In the notice of proposed rulemaking, the Secretary requested comments on whether the proposed regulations would require transmission of information that is being gathered by or is available from any other agency or authority in the United States. Based on the response to the proposed rules and its on own review, the Department has determined that the regulations in this document do not require transmission of information that is being gathered by or is available from any other agency or authority of the United States.

List of Subjects

34 CFR Part 350

Administrative practice and procedure, Education, Educational research, Grant programs—education, Handicapped.

34 CFR Part 360

Education, Educational research, Grant programs—education, Handicapped, Manpower training programs, Vocational rehabilitation.

Dated: June 7, 1988.

William J. Bennett,

Secretary of Education.

(Catalog of Federal Domestic Assistance Number 84.133P, National Institute on Disability and Rehabilitation Research)

The Secretary amends Title 34 of the Code of Federal Regulations by amending Part 350 and adding a new Part 360 as follows:

PART 350—DISABILITY AND REHABILITATION RESEARCH: GENERAL PROVISIONS

1. The authority citation for Part 350 continues to read as follows:

Authority: 29 U.S.C. 760–762, unless otherwise noted.

2. Section 350.1 is amended by revising the introductory text in paragraph (b) and adding a new paragraph (b)(10) to read as follows:

§ 350.1 Disability and rehabilitation research.

* * * * *

(b) The Secretary awards financial assistance through ten types of programs:

* * * * *

(10) Research Training and Career Development Projects (34 CFR Part 360).

(Authority: Secs. 200, 202, and 204; 29 U.S.C. 760, 761a, and 762)

3. Section 350.2 is amended by revising the introductory text to read as follows:

§ 350.2 Who is eligible for assistance under these programs?

The following agencies and organizations are eligible for grants or contracts as appropriate under these programs, except for programs described in 34 CFR Parts 356, 359, and 360:

* * * * *

4. Section 350.3 is amended by revising paragraph (c) to read as follows:

§ 350.3 What regulations apply to these programs?

* * * * *

(c) The regulations in 34 CFR Part 351, 352, 353, 354, 355, 356, 357, 358, 359, or 360, as appropriate; and

* * * * *

5. Section 350.20 is revised to read as follows:

§ 350.20 What are the application procedures under these progams?

An applicant for assistance under 34 CFR Parts 351, 352, 353, 354, 355, 357, 358, 359, or 360, shall submit a copy of its application to the appropriate state rehabilitation agency or agencies for comment in accordance with the procedures in EDGAR, 34 CFR 75.155–75.159.

(Authority: Secs. 204(c) and 306(i); 29 U.S.C. 762(c) and 766(a))

6. Section 350.30 is amended by revising the second sentence to read as follows:

§ 350.30 To whom does the Secretary refer an application?

* * * Peer review panels review applications for the Secretary on the basis of selection criteria described in 34 CFR 350.34, 352.31, 353.31, 358.32, 359.31, or 360.31, as appropriate.

* * * * *

7. Section 350.40 is amended by revising paragraph (a) to read as follows:

§ 350.40 What are the matching requirements?

(a) The Secretary may make grants to pay for part of the costs of research and demonstration projects that bear directly on the development of procedures, methods, and devices to assist the provision of vocational and other rehabilitation services, and research training and career development projects. Each grantee must participate in the costs of those projects. The specific amount of cost sharing to be borne by each grantee is negotiated at the time of the award and is not a factor that is considered in the selection process.

* * * * *

8. A new Part 360 is added to read as follows:

PART 360—DISABILITY AND REHABILITATION RESEARCH: RESEARCH TRAINING AND CAREER DEVELOPMENT PROGRAM

Subpart A—General

Sec.

Subpart B—What Kinds of Activities Does the Department Support Under This Program?

Subpart C—[Reserved]

Subpart D—How Does the Secretary Make a Grant?

Subpart E—What Conditions Must Be Met After an Award?

Authority: 29 U.S.C. 760–762, unless otherwise noted.

Subpart A—General

§ 360.1 What is the Research Training and Career Development Program?

The purpose of this program is to expand capability in the field of rehabilitation research by supporting projects that provide advanced training in rehabilitation research.

(Authority: 29 U.S.C. 761a(k))

§ 360.2 Who is eligible for assistance under this program?

Institutions of higher education are eligible to receive assistance under this program.

(Authority: 29 U.S.C. 761(a)(k))

§ 360.3 What regulations apply to this program?

The regulations referenced in 34 CFR 350.3 apply to this program.

(Authority: 29 U.S.C. 761a(i)(l))

§ 360.4 What definitions apply to this program?

The definitions listed in 34 CFR 350.4 apply to this program.

(Authority: 29 U.S.C. 761a(i)(l))

Subpart B—What Kinds of Activities Does the Department Support Under This Program?

§ 360.10 What types of projects are authorized under this program?

The Research Training and Career Development Program provides financial assistance for projects of advanced training in rehabilitation research. These projects provide research training and experience at an advanced level to individuals with doctorates or similar advanced degrees who have clinical or other relevant experience, including experience in management or basic science research, in fields pertinent to rehabilitation in order to qualify those individuals to conduct independent research on problems related to disability and rehabilitation.

(Authority: 29 U.S.C. 761a(k))

§ 360.11 What types of activities are required under these projects?

Each project must include the following activities:

(a) Recruitment and selection of candidates for advanced research training.

(b) Provision of a training program that includes didactic and classroom instruction, is multidisciplinary, and emphasizes scientific methodology, and that may involve collaboration among institutions.

(c) Provision of research experience, laboratory experience or its equivalent in a community-based research setting, and a practicum that involve each individual in clinical research and in practical activities with organizations representing individuals with disabilities.

(d) Provision of academic mentorship or guidance, and opportunities for scientific collaboration with qualified researchers at the host university and other appropriate institutions.

(e) Opportunities for participation in the development of professional presentations and publications, and for attendance at professional conferences and meetings as appropriate for the individual's field of study and level of experience.

(Authority: 29 U.S.C. 761(a)(k))

Subpart C—[Reserved]

Subpart D—How Does the Secretary Make a Grant?

§ 360.30 How is peer review conducted under this program?

Peer review is conducted under this program in accordance with 34 CFR 350.30–350.32.

(Authority: Sec. 202(e); 29 U.S.C. 761a(e))

§ 360.31 What selection criteria are used under this program?

(a) *Importance and potential contribution.* (20 points) (Note: For fiscal year 1988 only, the maximum number of points to be awarded under this criterion is 10 points.) The Secretary reviews each application to determine to what degree—

(1) The applicant is responsive to any priority established under § 360.32;

(2) The applicant proposes to provide training in a rehabilitation discipline or area of study in which there is a shortage of qualified researchers, or to provide training to a trainee population in which there is a need for more qualified researchers, such as clinicians in rural areas, or clinicians who are directly experienced with underserved populations; and

(3) The applicant is likely to make a significant increase in the number of trained rehabilitation researchers.

(b) *Quality of proposed training program.* (40 points) The Secretary reviews each application to determine to what degree—

(1) The applicant's proposed recruitment program is likely to be effective in recruiting highly qualified trainees;

(2) The proposed didactic and classroom training programs emphasize scientific methodology, are multidisciplinary, comprehensive, and appropriate to the level of the trainees, and are likely to produce qualified independent researchers;

(3) The quality and extent of the academic mentorship, guidance, and supervision to be provided to each individual trainee are of a high level and are likely to produce highly qualified researchers;

(4) The type, extent, and quality of the proposed clinical and laboratory research experience, incuding the opportunity to participate in research on meaningful topics at an advanced level, are likely to develop individuals with the capacity to perform independent research; and

(5) The opportunities for collegial and collaborative activities, exposure to outstanding scientists in the field, and opportunities to participate in the preparation of scholarly or scientific publications and presentations are extensive and appropriate.

(c) *Personnel and resources committed to the project.* (30 points) The Secertary evaluates each application to determine to what degree—

(1) The activities of the project will be implemented by sufficient and qualified staff who are outstanding scientists in the field;

(2) The project director and other key staff are experienced in the delivery of advanced research training as well as knowledgeable about the methodology and literature of pertinent subject areas;

(3) All required disciplines are effectively included; and

(4) The applicant possesses the appropriate facilities, laboratories, and access to clinical populations and organizations representing persons with disabilities to support the conduct of advanced clinical rehabilitation research.

(d) *Management and operating plans.* (10 points) (Note: For fiscal year 1988 only, the maximum number of points to be awarded under this criterion is 20 points.) The Secretary evaluates each application to determine to what degree—

(1) There is an effective plan of operation that ensures proper and efficient administration of the project;

(2) There is an effective plan for collaboration with other institutions of higher education and organizations whose participation is necessary to ensure effective classroom and clinical research training;

(3) The applicant, as part of its nondiscriminatory employment practices, will ensure that its personnel are selected without regard to race, color, national origin, gender, age, or handicapping condition;

(4) The applicant has provided an adequate plan for the use of facilities, resources, supplies, and equipment;

(5) The budget for the project is reasonable and adequate to support the proposed activities; and

(6) The applicant provides an appropriate plan for the evaluation of all phases of the project.

(Authority: 29 U.S.C. 761a(e) and 76(a)(k))

(Approved by the Office of Management and Budget under Control Number 1820–0027)

§ 360.32 What are the priorities for funding under this program?

(a) Each year, the Secretary may establish priorities to support research training in one or more of the following areas of study:

(1) Medicine or medical specialties, such as physical medicine and rehabilitation; neurology; orthopedics; otolaryngology; rheumatology; psychiatry; family medicine; endocrinology; pediatrics; podiatry; dentistry; urology; plastic and reconstructive surgery; or maxillofacial prosthodontics.

(2) Allied health professions, such as physical therapy; occupational therapy; nursing; audiology; speech pathology; psychology; or recreational therapy.

(3) Engineering and rehabilitation technology fields, such as prosthetics and orthotics; engineering; design; architecture; computer applications; or biomechanics.

(4) Miscellaneous clinical or technical fields, such as rehabilitation counseling; social work; law; social and behavioral sciences; gerontology; or demographics.

(b) The Secreatary establishes any priorities under this section through a notice in the **Federal Register.**

(Authority: 29 U.S.C. 760–762)

Subpart E—What Conditions Must Be Met After an Award?

§ 360.40 What is the required duration of the training?

A grantee shall provide training to individuals that is not less than one academic year in duration, unless a longer training period is required to ensure that each trainee is qualified to conduct independent research upon completion of the course of training. (Note: For fiscal year 1988 only, the minimum required training period is two academic years.)

(Authority: 29 U.S.C. 760–762)

§ 360.41 What level of participation is required of trainees?

Individuals who are receiving training under this program shall devote a minimum of eighty percent of their time to the activities of the training program during the training period.

(Authority: 29 U.S.C. 760–762)

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Tuesday
June 21, 1988

Part V

Department of Transportation

Federal Aviation Administration

14 CFR Part 91

Transponder With Automatic Altitude Reporting Capability Requirement; Final Rule

DEPARTMENT OF TRANSPORTATION

Federal Aviation Administration

14 CFR Part 91

[Docket No. 25531 Amdt. No. 91-203]
RIN 2120-AC66

Transponder with Automatic Altitude Reporting Capability Requirement

AGENCY: Federal Aviation Administration (FAA), DOT.

ACTION: Final rule.

SUMMARY: This action establishes requirements for an aircraft to have an operating transponder (basic transponder or Mode S transponder) with automatic altitude reporting equipment (referred to in this document as "a transponder with Mode C") when operating in the vicinity of certain primary airports for which a terminal radar approach control service area has been established, and in other airspace at and above 10,000 feet mean sea level (MSL). Implementation of this action is being accomplished in two phases. Phase I will require a transponder with Mode C at and above 10,000 feet MSL, and in the vicinity of terminal control area (TCA) primary airports. Phase II will implement a transponder with Mode C requirement in the airspace in the vicinity of airport radar service area (ARSA) primary airports (see charts in the appendix to this document). Also in Phase II, a transponder with Mode C requirement at other airports for which a TCA or ARSA has not been designated is being adopted in this rule at Logan International Airport, Billings, MT, and Hector International Airport, Fargo, ND; other such airports will be considered for a similar requirement on a case-by-case basis under separate rulemaking. These changes are intended to significantly reduce the potential for midair collisions in terminal and en route airspace.

EFFECTIVE DATE: July 21, 1988.

FOR FURTHER INFORMATION CONTACT: Mr. Reginald C. Matthews, Airspace-Rules and Aeronautical Information Division, ATO-200, Federal Aviation Administration, 800 Independence Avenue, SW., Washington, DC 20591, telephone (202) 267-8783.

SUPPLEMENTARY INFORMATION:

Background and Related Rulemaking Actions

On December 2, 1985, the FAA issued a rule, informally called the "transponder-on" rule (50 FR 45599, December 5, 1985). The "transponder-on" rule requires any person operating an aircraft equipped with an operable transponder to have that transponder turned on while operating in controlled airspace. In addition, if the aircraft is equipped with automatic altitude reporting equipment, that equipment must also be turned on. The "transponder-on" rule is intended to enhance aviation safety by providing an increased degree of aircraft target visibility to radar controllers in air traffic control (ATC) facilities. The transponder-on environment has enhanced aviation safety by increasing controller awareness and facilitating controller recognition and resolution of potential traffic conflict situations between controlled and non-controlled aircraft.

On February 3, 1987, the FAA published the Mode S final rule in the **Federal Register** (52 FR 3380). That rule pertains to the use, installation, inspection, and testing of air traffic control radar beacon systems (ATCRBS) and Mode S Transponders in U.S.-registered civil aircraft. The portion of that rule requiring a transponder with Mode C for operation in Group II TCA's was effective on December 1, 1987, with other portions effective in various phases through January 1, 1992.

On February 12, 1988, the FAA published Notice 88-2 (53 FR 4306) proposing to establish a transponder with Mode C requirement in all airspace within 40 miles of an airport for which terminal radar approach control service has been established, and in all other controlled airspace above 6,000 feet above the surface (AGL) or 12,500 feet MSL whichever is lower. While Notice 88-2 also proposed to replace the Continental Control Area (CCA) with the United States (U.S.) Control Area, Notice 88-2 primarily responded to two recently enacted statutes requiring the FAA to broaden its existing requirement for the use of transponders with Mode C. First, the *FY 1988 Continuing Resolution* (Pub. L. 100-202) provides that the FAA shall issue regulations requiring a transponder with Mode C on all aircraft operating: (1) In terminal airspace where ATC radar service is provided, and (2) in all other controlled airspace above a minimum altitude determined by the FAA. Under this statute, a final rule must be issued by December 22, 1988, and must be made effective at the earliest feasible date. Second, *The Airport and Airway Safety and Capacity Expansion Act of 1987* (Pub. L. 100-223) provides that the FAA shall require a transponder with Mode C in designated airspace where radar service is provided for separation of aircraft. Under Pub. L. 100-223, access to designated airspace other than TCA's and ARSA's may be granted to nonequipped aircraft if such access will not interfere with normal traffic flow. Additionally, Pub. L. 100-223 provides that a final rule must be issued by June 30, 1988, and must be made effective no later than December 30, 1990.

Prior to the issuance of Notice 88-2, the FAA, on June 16, 1987, issued Notice 87-7 (52 FR 22918) proposing to require all aircraft operating within 30 miles of a TCA primary airport to be equipped with a transponder with Mode C. Additionally, Notice 87-7 proposed to: (1) Establish other pilot and equipment requirements associated with operations in a TCA, and (2) establish a single-class TCA which would replace the existing three groups of TCA's.

Analysis of Comments

Due to the overlapping nature of the transponder with Mode C proposals in Notices 87-7 and 88-2, the overwhelming public response to the proposals, and the FAA's interest in dealing with the issues associated with those proposals, the final rule adopted today in Notice 88-2 has the effect of obviating the Mode C issues in Notice 87-7. Disposition of the other proposals in Notice 87-7 and the issue of lowering the floor of controlled airspace reflected in Notice 88-2 will be addressed outside the framework of this final rule.

The FAA received approximately 7,000 comments concerning the proposals in Notice 87-7. In addition, the FAA received approximately 43,000 pre-printed form letters that did not address the specifics of the proposals in Notice 87-7 but were generally critical of the more restrictive rules associated with flight in busy terminal areas. In response to the proposals in Notice 88-2, the FAA received more than 50,000 comments. The vast majority of these comments expressed general opposition to the proposals. The following is a categorization and discussion of the substantive comments received on both proposals.

Notice 88-2 Exceeded Congressional Intent

Many commenters, including members of Congress, suggested that the FAA exceeded the requirements of the recent legislative enactments with the proposals contained in Notice 88-2.

As stated earier, Notice 88-2 proposed to require a transponder with Mode C for any operation within a 40-mile radius of more than 250 airport locations, and for operations in controlled airspace above 6,000 feet AGL or 12,500 feet MSL whichever is lower. These proposals were intentionally broad, based on the

FAA's interest in soliciting comments on the widest possible range of alternatives. As with most proposed rulemaking actions, the FAA fully anticipated that comments and further considerations could generate modifications to the proposal.

In the process of developing a rulemaking proposal based on the legislation, the FAA needed to consider the respective applicability of the two statutes, which are not identical, and the degree of rulemaking discretion they afforded the FAA. The FAA has assumed, in order to promulgate a final rule that will fulfill the legislative mandate, that the laws permit the FAA to provide for the exception of certain categories of nonequipped aircraft from the transponder with Mode C requirement. This conclusion is supported by the content of Congressional correspondence received since the publication of Notice 88–2. These letters uniformly consider the FAA to have the flexibility and exception authority which is incorporated in Pub. L. 100–233. It is FAA's belief that the regulations adopted herein are in compliance with the legislation.

Establishment of Controlled Airspace

Many commenters objected to the proposed replacement of the CCA with the U.S. Control Area being included with the transponder with Mode C aspects of Notice 88–2. These commenters expressed a belief that the U.S. Control Area proposal was an airspace "grab" and that the FAA was disguising it with the legislative mandates of Pub. L. 100–202 and Pub. L. 100–223. Further, other commenters stated opposition to this aspect because they believed that such an action would require all aircraft operating in the U.S. Control Area to be under positive control. Many commenters were unaware that a common floor for controlled airspace already exists at 1,200 feet AGL east of the Mississippi and in a large portion of the Western U.S. Other commenters objected to the proposal mistakenly assuming that operations in the Eastern U.S. above 1,200 feet would be grounded because of the increased flight visibility requirements, when such requirements already exist. Another commenter suggested that the CCA be rescinded.

Based on the overwhelming number of comments received concerning this issue that indicated a basic misunderstanding of the effect of controlled airspace, the FAA is separating this aspect of the proposal from the other proposals in Notice 88–2. The disposition of the U.S. Control Area proposal will be addressed outside the framework of this final rule.

Transponder with Mode C Proposals in Notice Nos. 87–7 and 88–2

The preponderance of commenters expressed general objection to the transponder with Mode C proposals in Notice Nos. 87–7 and 88–2. Many commenters were of the opinion that the proposal in Notice 88–2 to require a transponder with Mode C within a 40-mile radius of certain airports is unnecessary, especially when it followed the proposal in Notice 87–7 to require the transponder with Mode C in the airspace within 30 miles of a TCA primary airport.

The FAA reviewed the Mode C proposal of Notice 87–7 in light of Pub. L. 100–202 and Pub. L. 100–223. It is the FAA's opinion that the scope of the legislation, which referred to terminal airspace where radar is utilized to separate aircraft (more than 250 airports), is broader than the scope of the transponder with Mode C proposal in Notice 87–7, which affected only 23 terminal areas. I.e., the Notice 87–7 proposal for a 30-mile-radius at TCA locations might not have met the requirement of the public laws. Thus, the 40-mile-radius proposal was developed and issued to solicit public comments on the widest possible alternatives to the FAA proposal with an expectation that the proposal could be modified in response to further study and public comments and recommendations. Subsequently, the FAA suspended further action on the disposition of the proposals in Notice 87–7 pending a determination on the proposals in Notice 88–2. The action taken in this final rule obviates the need for the transponder with Mode C proposals contained in Notice No. 87–7. The disposition of other issues related to controlled airspace, single-class TCA, student pilots, and helicopter equipment will be addressed outside this rulemaking action.

Floor of the Transponder Equipment Requirement

Many commenters objected to the lowering of the floor for the en route transponder with Mode C requirement from 12,500 feet MSL to 6,000 feet AGL or 12,500 feet MSL, whichever is lower. Commenters based their objections on the perception that the FAA exceeded the scope of the legislation, or on the absence of radar coverage in some areas at and above 6,000 feet AGL. Many commenters recommended that the FAA establish 12,500 feet as the floor for the en route transponder with Mode C requirement. Other commenters included recommendations to establish 10,000 feet MSL as the base altitude because of the perception that air carrier aircraft seldom operate below that altitude except when transitioning to/from terminal airspace. Some commenters stated that the 250-knot speed limit below 10,000 feet MSL and the increased visibility requirement above 10,000 feet MSL preclude the need to change the floor for the en route transponder with Mode C requirement because pilots of aircraft operating below 12,500 feet MSL would be operating either at slower speeds or with visibility ranges at or greater than 5 miles, or both. Such operators, it was argued, would be able to see and avoid other aircraft without intervention from ATC.

Under the legislation, the FAA was mandated to require a Mode C transponder in other (non-terminal) airspace at an altitude to be determined by the FAA. The FAA could infer that it was the intent of Congress that the agency not retain the existing floor of 12,500 feet MSL; otherwise, there would be no need for that aspect of the legislation. The proposal to lower the floor of the en route transponder with Mode C requirement was based on actual or planned national radar coverage. Existing radar coverage at 6,000 feet above the elevation of en route radar sites virtually covers the entire Continental U.S. Based on the comments and other factors, however, the FAA has adopted 10,000 feet MSL as the floor of the en route transponder with Mode C requirement. Operations conducted outside terminal airspace above 10,000 feet MSL but below 2,500 feet AGL do not require a tranponder with Mode C. The factors for adopting 10,000 feet MSL as the floor of the en route transponder with Mode C requirement include the fact that the preponderance of aircraft that operate above 10,000 feet MSL are already equipped with the required equipment, so the number of operators affected by the new requirement will be minimal. While the increased visibility minimum above 10,000 feet MSL does provide benefit to aircraft operating above that altitude, the FAA believes that an absence of a 250-knot speed limit above 10,000 feet MSL, with its associated impact on a pilot's ability to see and avoid other aircraft, provides the basis for lowering the floor of the en route transponder with Mode C requirement from 12,500 to at least 10,000 feet MSL. However, FAA will consider a reevaluation of this adjustment in light of national ATC radar coverage, implementation and evolution of TCAS

equipage trends, identification of the types of aircraft that routinely operate at altitudes below 10,000 feet MSL, and other safety factors.

Controller Selective Awareness

An aviation organization, in disagreement with the proposed transponder requirements, stated that the FAA and the public must recognize that the ATC system is not a self-contained automation system, but that it is a system that is dependent on a controller's ability to see and utilize the information provided. This organization stated that it has seen by example in two recent midair collisions that a controller did not effectively use the data which he/she was provided.

There are reasons, relating to both actual working conditions and to perception, why a controller may not observe a radar target on his/her radar display. While it is conceivable that ATC automated radar tracking and display systems will detect, but *not* display, a radar target on a controller's radar screen, the probability of such an occurrence is remote. This anomaly may be the result of a computer-hardware failure along the "path" between the detection and the display computer subsystems. Since these failures are not a regular occurence, it is reasonable to assume that in the midair collisions the radar targets of the non-controlled aircraft were displayed, but for some unknown reason other than hardware failure the targets were not noted by the controllers.

The need for improved detection and depiction became evident in the early stages of the use of radar in providing ATC service. The following discussion summarizes the problem and the continuing efforts to address it.

Positive control areas (PCA) were established in certain airspace to exclude non-controlled aircraft. Complementing the PCA implementation, the FAA in 1973 established the requirement for aircraft to be equipped with and operate a transponder while in a PCA. A transponder in an aircraft provides a radar controller with a more discernable radar target of that aircraft by reinforcing the less-obvious basic or primary radar target. Thus, a controller was provided with the means to better track controlled traffic and provide traffic advisory information to the controlled traffic concerning other transponder-equipped aircraft.

This transponder requirement has had a negative effect, however, in that controllers are less likely to detect radar targets of uncontrolled aircraft not equipped with a transponder or a transponder with Mode C. To illustrate, as a controlled transponder-equipped aircraft proceeds through a terminal area at lower altitudes, it would more than likely traverse areas of heavy radar target concentration primarily from non-controlled aircraft. Such an area may have coincided with or overlapped the traffic patterns of other airports, where aircraft would be operating at altitudes that would not normally conflict with the controlled aircraft. On the radar screen, the non-controlled aircraft would appear close to the controlled traffic but would in fact be well below the controlled traffic.

In most of these situations, the controller would provide only general traffic information. Moreover, because in the prior ATC environment the issuance of traffic advisories was classified as an additional duty, the priority of providing traffic information was low in comparision to a controller's primary duty to separate controlled aircraft. Further, a controller responsible for aircraft operating in a PCA could very well have assumed that once the controlled traffic entered a PCA, traffic advisory information concerning radar targets of non-controlled aircraft need not be issued since all aircraft operating in a PCA had received an appropriate ATC clearance and were being adequately separated.

With the establishment of the TCA program, a controller could also reasonably assume that randomly-detected radar targets within the lateral limits of the TCA are from aircraft actually operating above or below TCA airspace and, therefore, not in conflict with aircraft operating inside the TCA. This assumption tended to reduce the controller's concentration on radar targets of non-controlled aircraft without automatic altitude reporting capability, even though such a randomly-detected target could in fact be an aircraft that unknowingly, or otherwise, entered a TCA without an ATC clearance.

Recognizing the limitations of traffic advisory service as a non-mandatory, workload-permitting service, the FAA upgraded the service, in part, to a priority equal to that of providing aircraft separation to controlled aircraft. A controller is now required to issue aircraft pertinent control instructions to assist in avoiding an unsafe situation involving another aircraft or terrain. This type of service is called a safety alert. Optional aspects of the service were, therefore, eliminated. In the current ATC environment, a situation requiring a safety alert can be brought to the controller's attention by the automated system with a conflict alert or a low altitude alert provided the aircraft is appropriately equipped.

A partial solution to the problem of controller-nondetection of non-controlled aircraft was brought about by the transponder with Mode C requirement in all controlled airspace above 12,500 feet MSL and in certain TCA's. That requirement facilitated controller receipt of more information concerning non-controlled traffic operating in the stratum between 12,500 feet MSL and the floor of a PCA as well as on those aircraft climbing to, or descending from that stratum. With this altitude information, controllers are better able to select radar targets that are potential conflicts for controlled aircraft. For example, automated ATC system can utilize such information to filter out those targets operating outside of certain altitude ranges which would not be factors to the aircraft that are being or would be controlled in a specific airspace area. Automated ATC systems present the controller with altitude information on non-controlled or unknown aircraft equipped with a radar transponder and Mode C when such aircraft are detected to have penetrated the airspace defined by the appropriate altitude filter limits. With this type of alert, the controller can take the appropriate action to maintain a margin of safety between the known aircraft and the unknown or non-controlled target.

Another existing automation feature that can contribute significantly to the solution and is programmed for enhancement is the presentation to the controller of a conflict alert when two radar targets (one of which may represent an unknown aircraft) are estimated to approach each other with less than a specified horizontal or vertical distance. A conflict alert can be presented conspicuously to the controller, prompting him/her to take action to ensure that safety is maintained. This feature is most efficient in situations where both of the aircraft involved are equipped with a transponder with Mode C.

Advantages of a Transponder with Mode C Equipment

A number of comments related to the benefits of a transponder with Mode C requirement for both air traffic control and collision avoidance and, generally, the extent to which a requirement for such equipment should apply. Some commenters, including one aviation organization, argued that the proposed transponder requirements should not apply to uncontrolled airspace or in airspace where radar service is not

available. Other commenters argued that justification cited in the proposals did not substantiate the proposed mandatory transponder with Mode C equipment requirement. An organization in general agreement with the proposal stated that it believes that the FAA must take prompt action to enhance the ATC system by providing collision protection between non-controlled and controlled aircraft. Another organization stated that the FAA should extol the benefits of the transponder with Mode C as a complement to airborne collision avoidance systems. Additionally, an argument was made by general aviation advocates that pilots who operate solely under visual flight rules (VFR) and who do not take advantage of available ATC services will not receive any safety benefits from the proposed transponder with Mode C requirements.

There are distinct safety advantages attributable to transponders with Mode C equipment. Automated ATC radar tracking systems are programmed, based on this equipment, to provide automatic conflict alert and low-altitude alert warnings to the controller, which can be quickly relayed to the pilot(s). Aircraft altitude information derived from this equipment can be displayed directly on a controller's radar screen. This equipment will activate traffic alert and collision avoidance systems (TCAS) in aircraft equipped with TCAS.

An advantage of a transponder with Mode C is derived from an existing capability of automated ATC radar tracking systems. These systems are currently programmed to continually predict and update the paths of Mode C transponder-equipped aircraft being controlled by ATC. These predictions are constantly compared with those of other controlled aircraft that are also tracked by the system. In addition, these systems compare the aircraft data with pre-programmed terrain information. If any of the comparisons predict a potentially hazardous situation for a controlled aircraft, a visual and aural alarm immediately alerts the controller who issues safety instructions to the aircraft. Furthermore, a new software feature called "Mode C Intruder" (MCI) is being implemented in the automated en route ATC system and will eventually be implemented in the terminal ATC systems. The MCI feature establishes tracks on transponder with Mode C-equipped aircraft that are not being controlled by ATC and alerts controllers to potential conflicts between controlled and non-controlled aircraft.

Having nearly all aircraft equipped with transponders with Mode C in specified airspace provides controllers with a continuous, more complete traffic picture. This allows altitude, distance, and azimuth information to be correlated and control instructions to be issued to assure that safe separation is provided between controlled and non-controlled aircraft. In addition, radio communications are reduced. For example, controllers would not have to repeatedly ask pilots to report altitude, and aircraft climb/descent paths can be independently monitored for possible conflicts with other traffic. Unnecessary traffic advisories concerning non-controlled aircraft (equipped with a transponder with Mode C) are eliminated. This is true even when such aircraft are in uncontrolled airspace; therefore, it is not necessary for an aircraft equipped with a transponder with Mode C to be in controlled airspace for pilots of affected aircraft and ATC to receive the benefits of such equipment.

The FAA has proposed rulemaking to require airborne traffic alert and collision avoidance systems on larger aircraft (Notice 87–8; 52 FR 32268, August 26, 1987). A transponder with Mode C has the ability to provide critical information to TCAS-equipped aircraft. The TCAS equipment transmits periodic interrogation signals. If a nearby aircraft is equipped with a basic transponder, that aircraft's range and azimuth from the TCAS-equipped aircraft is calculated by the TCAS-equipped aircraft. However, if a nearby aircraft is equipped with a transponder with Mode C, altitude information is provided in addition to range and azimuth. TCAS will assimilate the data and consolidate range, direction, and altitude information, when available, into a collision risk prediction and issue traffic advisories to the flightcrew.

While TCAS I will alert a flightcrew of a collision potential, a crew so alerted must determine the correct course of action to avoid a collision. TCAS II and TCAS III will issue resolution advisories, which are instructions to a flight crew as to what evasive actions are most appropriate to avoid a collision. TCAS II provides resolution advisories in a vertical plane, and TCAS III would provide resolution advisories in both vertical and horizontal planes.

Pilots of aircraft equipped with a transponder with Mode C who choose, where permitted, to operate without the assistance of ATC will indirectly benefit from such equipment. For example, TCAS-equipped aircraft are better able to avoid such aircraft; and, when such aircraft are under surveillance of ATC radar, controllers are better able to maintain safe distances between such aircraft and those aircraft being controlled.

For these reasons, the FAA finds that there is justification for a general transponder with Mode C requirement in both controlled and uncontrolled airspace at certain locations.

Access to Terminal Airspace

Many commenters, including members of Congress, objected to the proposal to establish a transponder with Mode C requirement at all airports where terminal radar approach control service exists. Some commenters suggested the FAA limit the application to a 30-mile radius of TCA primary airports as proposed in Notice 87–7. Others suggested that the requirement be limited to TCA/ARSA/terminal radar service areas (TRSA) airports. Some commenters even suggested reducing the size of the affected terminal airspace as a compromise to the 40-mile radius proposed in Notice 88–2. Many commenters suggested that authorization provisions be provided for nonequipped aircraft.

An aviation organization stated that it was of the opinion that "cut-outs" should be provided to accommodate operations below 1,200 feet above the surface. Within these "cut-outs," aircraft could operate without the proposed transponder equipment from or to airports outside the surface areas of designated airspace. One commenter stated the FAA should consider the site-specific need for airspace exclusions through which non-controlled aircraft could safely operate provided these corridors/airspace exclusions do not affect the safety of controlled aircraft.

Another aviation organization strongly urged the FAA to include provisions to allow nonequipped aircraft to operate under a TCA or ARSA floor or within the airspace where a transponder with Mode C is required. Another organization stated that it believes a limited number of aircraft can be safely accommodated in areas where a transponder with Mode C would be required provided such aircraft were conducting ingress/egress operations at altitudes below 2,500 feet AGL to airports outside designated airspace.

An aviation organization, although in general agreement with the proposed transponder requirements, stated that aircraft authorized to deviate from the transponder requirement should not be permitted to fly within 1,000 feet of the floor of a TCA unless that aircraft is equipped with a transponder with Mode C, but in no case should any aircraft be

allowed to operate within 500 feet of the floor of the TCA.

As stated earlier, the FAA proposals in Notice 88–2 were intentionally broad to gather the widest possible alternatives and suggestions through public comments. The FAA has considered the comments in regard to reducing the scope of the proposed requirement and believes that such a reduction can be made, in compliance with the legislation, without significantly reducing the safety benefits envisioned by the proposals. Further, the FAA believes that the greatest benefit of an expanded transponder with Mode C requirement will be realized in the airspace surrounding airports with the highest number of passenger enplanements and aircraft operations. The airspace surrounding such airports is typically designated as a TCA or ARSA. At other airports which do not meet the current TCA or ARSA establishment criteria, the FAA believes a transponder with Mode C requirement equivalent to that for ARSA's should be considered where the annual enplaned passenger count is sufficiently high.

In consideration of the foregoing comments, the FAA is limiting the transponder with Mode C requirement around TCA primary airports to that airspace within a 30-mile radius. With this action, the FAA is effectively adopting requirements for transponders with Mode C essentially the same as those proposed in Notice 87–7. While this airspace extends from the surface upward and will not have any "cut outs," provisions are being made for operations by nonequipped aircraft as discussed later in this document. Further, the issues of TCA/ARSA design, VFR transition routes through designated TCA's and equipment requirements on such routes, and other issues dealing with classification of TCA's will be addressed in the disposition of the non-Mode C proposals in Notice 87–7.

In regard to the airspace around ARSA primary airports, the transponder with Mode C requirement is being limited to the airspace within the lateral limits of an ARSA (normally a 10-mile radius). Additionally the airspace below an ARSA (normally beneath 1,200 feet AGL) is being effectively "cut out" to accommodate operations by nonequipped aircraft.

For airports not designated as a TCA or ARSA primary airport but where terminal radar approach control service is provided, the transponder with Mode C requirement is being limited to that airspace within 10 miles of such an airport. Similar to the requirement at ARSA locations, the airspace below 1,200 feet AGL outside of the airport traffic area (ATA) is also being excluded from the requirement in order to accommodate operations by nonequipped aircraft. Further, the FAA will consider such airports as candidates for imposing the transponder with Mode C requirement when the annual enplaned passenger count exceeds 200,000. The FAA believes that this number of enplaned passengers per year is a reasonable threshold for the level of air carrier activity that would support a more stringent transponder with Mode C requirement. However, the fact that an airport has experienced such an enplaned passenger count does not automatically trigger a transponder with Mode C requirement in the surrounding airspace. Each candidate airport will be considered on a case-by-case basis after a review clearly indicates that a significant safety benefit would be realized.

There are several airports that currently exceed 200,000 annually enplaned passengers which have not been designated as, or planned for an ARSA; e.g., Billings, MT, Fargo, ND, Eugene, OR, Sioux Falls, SD, Hilo, HI, Fairbanks, AK, etc. The FAA has examined the operations at each of these locations and has determined that a transponder with Mode C requirement should be established at Billings, MT, and Fargo, ND. Both of these airports have experienced a significantly high number of passenger enplanements, and both typically generate over 50,000 instrument operations per year.

Most of the other airports that experience over 200,000 annual passenger enplanements are located within a terminal radar service area (TRSA), have unique geographical limitations, relatively high number of instrument operations, complex traffic mixes, or extensive pilot training in proximity to the ATA. These factors will be considered in decisions to extend the transponder with Mode C requirement to airports that exceed 200,000 passenger enplanements.

TRSA's have been designated at most of the other non-TCA, non-ARSA locations where airport passenger enplanements exceed 200,000 per year. Aircraft operating in TRSA's are provided with air traffic control separation service. The provision of this service is mandatory on the part of ATC but voluntary on the part of pilots. Participation in ther air traffic control service is mandatory for pilots of aircraft operating in the ATA to or from the airport for which the ATA is designated, or those simply transiting the ATA. An ATA is in effect at all airports with an operating air traffic control tower.

Also, controlled airpsace has been established to the surface in the vicinity of each of these airports in the form of transition areas or control zones, or both. As a result, there is an existing requirement, under § 91.24(c), that transponder and Mode C equipment installed on an aircraft must be operated while in controlled airspace in the vicinity of these airports ("transponder-on" rule). In effect, a transponder with Mode C operating requirement already exists at these airports for all aircraft that are now or will in the future be equipped with such equipment. The FAA has determined that this requirement, in connection with other air traffic operating requirements at airports with terminal radar approach control service, provides the desired level of safety at this time. The FAA further considers this requirement to meet the mandate of Pub. L. 100–223 for a transponder with Mode C requirement in terminal airspace where radar service is provided. The exception for nonequipped aircraft at these airports is consistent with the legislation's provisions for access by nonequipped aircraft where such access will not interfere with the traffic flow.

In general, then, the rule adopted will require a transponder with Mode C in the terminal airspace of airports with terminal radar approach control service as follows: (1) In TCA and ARSA airspace; (2) from the surface to 10,000 feet MSL within 30 miles of a TCA primary airport, with certain exceptions for aircraft which were not originally certificated with an engine-driven electrical system or which have not subsequently been certified with such a system installed, balloons, and gliders; (3) in the airspace above an ARSA to 10,000 feet MSL; and (4) within 10 miles of additional high-passenger-traffic airports identified in Appendix D of Part 91. Moreover, in controlled airspace in the vicinity of other airports, pilots of all aircraft equipped with Mode A or Mode C transponders must operate that equipment, but no additional equipment requirement is imposed on operators of nonequipped aircraft.

Currently, the FAA provides for the exception of nonequipped aircraft from the transponder with Mode C requirements on a case-by-case basis by granting ATC authorizations under § 91.24(d). This provision has worked well in the past, and some provision of this nature is necessary for efficient control of air traffic in a transponder with Mode C environment. It is essential that the agency have the ability to

suspend or authorize exceptions from rules where necessary for safety or otherwise beneficial to ATC. For example, a controller must be empowered to direct a pilot to turn off a malfunctioning transponder or Mode C unit, or to direct a nonequipped aircraft through a regulated area if that is the safest route.

Accordingly, the FAA will assume that case-by-case ATC authorizations continue to be permitted under the terms of the recent legislation as a necessary concomitant of a general transponder with Mode C program. ATC authorizations will contain any conditions that may be necessary to provide a level of safety equivalent to operation by an aircraft equipped with transponder with Mode C.

It should be recognized that ATC will not be able to grant authorization in all cases requested. However, a person who has been denied an authorization to deviate from the requirement, and who believes that the requested authorization would have no adverse impact on safety or ATC services, may request an administrative review of the denial by the Air Traffic Division Manager for the FAA region in which the ATC facility is located. In addition, Part 11 of the FAR provides procedures for the filing of a petition for exemption from the regulations, where an exemption is warranted and would be a more appropriated form of relief.

Further, prior to the July 1, 1989, compliance date, the FAA will consider the impact of the required equipment in this final rule on aircraft not landing or taking off at TCA primary airports. Additionally, the FAA will look at providing access to outlying general aviation airports for those aircraft without the required equipment. The FAA will take such action only to the extent that it would be consistent with maintaining adequate safety within the TCA and the airspace surrounding the TCA primary airport.

Agricultural Aircraft Operations

An aviation organization, supported by other commenters, suggested that agricultural aircraft operations be excluded from the proposed transponder requirements. The organization stated that flight safety would be jeopardized if agricultural aircraft (AG) pilots were compelled to adjust transponder settings and make radio contact during an application operation. Further, the organization stated AG's regularly work from unimproved landing strips and repeated landings and takeoffs cause dust and dirt to affect delicate electronic avionics.

AG's are already required to be equipped with radio, navigational, and transponder capabilities in TCA's and are required to be equipped with two-way radios in ARSA's. The proposals in Notice Nos 87–7 and 88–2 did not address these issues with regard to fixed-wing aircraft. Further, AG's have historically obtained authorizations from ATC to operate without required equipment when necessary. The final rules being adopted does not alter those provisions for obtaining authorizations.

Aircraft Without Electrical Systems

Many commenters stated that it is not practical to install a transponder with Mode C on balloons and gliders and, therefore, such aircraft should be excluded from the proposed requirements. Several commenters stated that there has never been any indication that these types of aircraft have been hazardous to other aircraft operations in the area surrounding airports with terminal radar approach control service. Many commenters suggested that the FAA should exclude aircraft without electrical systems from any new transponder with Mode C requirement.

Currently, a transponder with Mode C is required on all aircraft (except gliders) operating above 12,500 feet mean sea level (MSL) in the U.S., except Hawaii and Alaska, transponders are required above 18,000 feet MSL in Alaska. Additionally, in a TCA, aircraft operations, including gliders and balloons, may only be conducted with a transponder with Mode C.

The fact that an aircraft is a glider or balloon does not diminish the safety benefits and increased efficiency of ATC control and pilot operations which the FAA is trying to achieve. However, there is no question that the proposed requirement, if adopted without modification, would have had an impact on operations conducted by aircraft which were not originally certificated with an engine-driven electrical system or which have not subsequently been certified with such a system installed, balloons, and gliders. Were there no contemplated provisions for exception or regulatory relief, some of these operators would be eliminated from certain airspace unless a transponder with Mode C were to be installed. The FAA has information that a portable, battery-operated transponder with Mode C is on the market. However, the unit apparently would require an antenna installation on some aircraft, raising certification questions, and its use is time-limited by the battery charge. The unit can function for approximately 4 hours between charges and can be purchased and installed for approximately $2,000. For these reasons the unit may well enable some operators to continue operating in the regulated airspace, but the unit does not appear to represent a universal solution to the issue. The FAA has reconsidered the need to impose all of the new transponders with Mode C requirements on such owners as proposed in Notice 88–2.

In regard to aircraft which were not originally certificated with an engine-driven electrical system or which have not subsequently been certified with such a system installed, balloons, and gliders, the final rule being adopted herein excludes or excepts such aircraft from the transponder with Mode C requirement when operating beneath the floors of a PCA (below 18,000 feet MSL) provided such operation is not conducted: (1) In any ARSA or TCA; (2) above the altitude of a TCA ceiling at and below 10,000 feet MSL within a 30-mile radius of a TCA primary airport; and (3) above an ARSA at and below 10,000 feet MSL within the lateral dimensions of that ARSA. Additionally, the FAA is extending compliance dates to facilitate the acquisition and installation of required equipment for those operators that plan to conduct flight in areas where a transponder with Mode C will be required. July 1, 1989, is the compliance date for operations within 30 miles of a TCA primary airport, and at and above 10,000 feet MSL; the compliance date for the remaining requirements is December 30, 1990.

The FAA believes that excluding aircraft which were not originally certificated with an engine-driven electrical system or which have not subsequently been certified with such a system installed, balloons, and gliders from a universal requirement for the transponder with Mode C requirement will not have a detrimental effect on the safety of other operations. For example, the small numbers of operations conducted by these types of aircraft that could interfere with traffic flows do not warrant requiring such equipment; balloons are conspicuously visible in VFR flight environments; other aircraft without an electrical system normally do not operate above 10,000 feet MSL; and in most cases, ATC and transient pilots have notice of the locations of glider operations.

Equipment Cost

Many commenters objected to the proposed transponder requirements stating that the acquisition and installation expense of transponders

and encoders is prohibitive. Others commented that such expenditure would have to be repeated because Mode S transponders are required after January 1, 1992.

Under Amendment No. 91–198 (52 FR 3380, February 3, 1987) all transponders installed after January 1, 1992, must meet the technical standard order for the Mode S transponder. However, that amendment permits transponders installed prior to January 1, 1992, to be used indefinitely until replaced. Therefore, there is no requirement that a transponder with Mode C be upgraded to Mode S after January 1, 1992, until such time as the transponder must be replaced.

A basic transponder costs approximately $1,050 and upgrading that transponder with Mode C equipment would cost an additional $850. The cost for a Mode S transponder with Mode C is estimated to be $2,900 or about $1,000 more than a comparable basic transponder with Mode C.

The congressional mandate to require the use of transponder with Mode C in additional airspace was not conditioned on the economic impact of the requirement, and the FAA acknowledges that some operators will experience the cost of installing the required equipment. The cost impact of the required equipment is discussed in more detail below in the summary of the Regulatory Evaluation.

ATC Operations

Numerous commenters were concerned that the transponder with Mode C requirement would have an adverse effect on the air traffic system. These commenters predict the creation of a radio frequency congestion problem as well as an inability of the ATC automation system to handle an increased number of transponder replies. One commenter stated that each year during the EAA Fly-In at Oshkosh, WI, when thousands of operations occur within a period of a few days, ATC directs pilots of participating aircraft to turn off their transponders while operating in the Oshkosh area. Other commenters suggested that the FAA should assure the ability of the ATC system to both cope with and then effectively use the additional information before any new transponder requirement is levied.

Numerous glider and balloon enthusiasts commented that it is unrealistic for ATC to expect them to follow ATC directions because of the aircraft's inability to maintain the type of directional control that is expected in an ATC environment. Other commenters suggested that, since ATC does not have the capability to control all aircraft within the terminal airspace associated with the more than 250 airports proposed for a transponder with Mode C requirement, it should not try to assert such control.

The FAA does not seek to control all aircraft operating outside a TCA, ARSA, or ATA, nor does the FAA expect that it would be necessary to require a balloon or a glider to follow a specified route (in areas outside the actual confines of a TCA or ARSA). Under current rules, however, both gliders and balloons, when operating *inside* a TCA or ARSA, are expected to comply with the regulations and ATC clearances and instructions just as all other aircraft are required to do. Under the proposed transponder provisions and under the rules being adopted herein, balloons and gliders operating outside of a TCA or ARSA, but in airspace where a transponder with Mode C is required, would be required to be equipped with a transponder and Mode C but not to communicate with ATC.

Under the transponder with Mode C proposals of Notices 87–7 and 88–2, no corresponding two-way radio communications requirements were proposed. Further, the rule being adopted does not impose any new communications requirement; nor should any appreciable workload increase be placed on ATC. Operators of aircraft with the required transponder with Mode C can continue on their route of flight without any new ATC involvement or communications requirement.

The FAA does expect, however, that occasionally requests will be made by pilots to continue flight without the proper equipment when an equipment failure occurs in flight. However, it is expected that such occurrences would be minimal considering the reliability of such equipment. Regarding planned flight without the required equipment, such flight would have to be approved in advance as is currently required in areas where such equipment is required. Requests for such flight are normally made via telephone communications prior to the flight's departure. Additionally, FAA expects a reduction in radio frequency usage because fewer traffic and safety advisories would be required in the environment with the vast majority of aircraft equipped with a transponder with Mode C. While the FAA does foresee a slight increase, at least initially, in two-way radio requests from aircraft to operate without the required transponder equipment, the FAA is confident that it is prepared to handle such requests during the transition period. Based on the voluntary transponder equipage trends and the amount of time in which the FAA is allowing aircraft operators to acquire and install the proper transponder equipment, the FAA is confident that the number of such requests will be minimal and manageable.

The FAA recognizes that there will be rare circumstances, such as the annual Oshkosh, WI, Fly-In, when ATC may request the pilot of an aircraft operating under VFR to turn off the transponder. However, such a request would be in the interest of segregating IFR operations from VFR operations under unusually heavy VFR operations where a large and concentrated number of aircraft are operating in a small segment of airspace, such as is the case in the annual Oshkosh, WI, Fly-In. The FAA does not envision such situations to occur in the vicinity of areas in which a transponder with Mode C is now required under this rule.

Some commenters stated that high performance aircraft are not allowed below the TCA; therefore, there should be no conflict with smaller aircraft in that airspace. Additionally, the commenters stated that there has never been a midair collision in the areas under TCA's.

Notwithstanding the absence of past midair collisions in the airspace beneath a TCA, it is a benefit to ATC to have as many aircraft as possible equipped with a transponder with Mode C when operating beneath a TCA. The general use of transponder with Mode C in this environment makes controllers aware of more unknown and non-controlled aircraft. This, in turn, facilitates a more positive decisionmaking process in regard to those aircraft being controlled. As stated earlier, however, gliders, balloons, and aircraft without electrical systems are being excluded from the transponder with Mode C requirement beneath the floors of TCA's and ARSA's.

Some commenters, including an aviation organization, suggested that the proposed transponder requirement would be unnecessary if ATC were to follow its own directives by keeping high-performance aircraft at higher altitudes until descent is necessary for landing. These procedures, the commenters stated, would help maintain separation between controlled and non-controlled traffic and would also reduce noise on the ground from these aircraft as well as conserve aviation fuel.

Under the current requirements of Part 91, only large turbine-powered aircraft are required to operate at or above the floors of a TCA and only

when conducting operations to or from a TCA primary airport, e.g., Seattle-Tacoma International Airport. This requirement does not apply to similar aircraft in a TCA that operate to or from other airports beneath the designated floors of a TCA, e.g., Boeing Field. The FAA agrees that the "Keep 'em High Program" is an effective method for segregating high-performance aircraft from other traffic. However, such procedures alone cannot assure controllers that certain received radar information on unknown or non-controlled traffic represents aircraft that are below the traffic being controlled by ATC. As mentioned earlier, these unknown aircraft appear on radar scopes as targets that are hazardously close to controlled aircraft. On the other hand, a non-controlled, nonequipped aircraft may actually intrude into a TCA dangerously close to controlled aircraft and the controller, well within the realm of expectation, may conclude that the intruder is below or above the TCA and take no action.

Another commenter objecting to the proposed transponder requirement was of the opinion that the FAA should provide some form of ATC service to all aircraft that would be required to be equipped with the proposed transponder equipment. An aviation organization stated that it believes that the FAA's philosophy associated with controller duty priorities renders the ATC system inadequate in assuring the protection of IFR aircraft from collision with unknown aircraft.

Preventing collisions by the application of aircraft separation and the issuance of safety alerts are a controller's first priority. This is true regardless if one of the aircraft is operating under VFR and is unknown to the controller. However, when potentially conflicting aircraft are equipped with transponders with automatic altitude reporting equipment, it enables controllers to relay decisive instructions associated with these procedures. Additionally, traffic advisory service is now provided by ATC in an ARSA and within 20 miles of an ARSA primary airport on a mandatory basis, and, elsewhere, on a workload-permitting basis.

Effect on Automated ATC Systems

An aviation organization stated that it expects that some ATC facilities, because of radar target capacity problems, will be forced to reduce the size of the area being processed to accommodate the expected increase in radar targets. The same organization commented that existing ATC terminal automation systems can only handle approximately 230 radar targets before the data displayed begins to flicker and become unusable. Some commenters suggested that the ATC system is already overloaded.

The most advanced terminal automation system in use today by the FAA has a capacity of 300 tracked targets for each radar sensor. Several TCA airports use 2 radar sensors which equates to a 600-target capacity. Using the Los Angeles, CA, terminal area as representative of a "worst case" situation (because of the number of aircraft based in that area and excellent VFR flying conditions), during the busiest hour of traffic for the month of August 1987, 284 aircraft with transponders were detected by the 2 Los Angeles radar sensors. This number includes all targets with transponders within the 55-mile-radius radar processing areas of the 2 sensors. Again, using the "worst case" situation of a 2.5:1 ratio of transponder targets to non-transponder targets, the number 284 would be increased to 397 total targets. (The 2.5:1 ratio is based on the 1985 statistics of the numbers of aircraft in the State of California versus the number of aircraft without transponders.) While an actual ratio for aircraft based in the Los Angeles area is not available to the FAA at this time, the FAA is confident, based on experience, that the 2.5:1 ratio would increase if limited to the aircraft within a 55-mile radius of Los Angeles. Further, based on the comments that a large number of aircraft without electrical systems would be affected by the proposed rules, this ratio will increase because of the provisions and exclusions being adopted herein for such aircraft. With this increased ratio, the number 397 would be significantly smaller. Even in the "worst case" scenario, the 397 total targets can be handled by the ATC automation systems. While it may be desirable for some locations to retain a 55-mile radius radar processing area, ATC terminal automation systems have a feature that can be used to selectively inhibit processing of radar data received from aircraft operating in segments of that area. For example, the number 397 can be reduced significantly by using a customized and reduced radar processing area. In doing so, radar tracking slots outside the customized radar processing area that would otherwise be used could be made available for radar targets inside the customized radar processing area. This feature may be activated in terminal automation systems with more than one radar sensor or with radar systems whose coverage overlaps that of an adjacent ATC facility.

The FAA does, however, have terminal automated ATC systems with only one radar sensor. Further, it is extremely difficult to predict accurately when any such systsem would reach its critical capacity of 70% of available computer capacity. Accordingly, the FAA has addressed these factors in its accelerated facilities enhancement program. This program is designed to provide hardware/software automation system enhancements to satisfy the transponder with Mode C requirements of this rule until current terminal systems are replaced.

Two aviation organizations were of the opinion that additional significant safety gains could be achieved by upgrading the terminal automation systems to provide controllers with computer-generated alerts to developing collision threats between any controlled aircraft equipped with altitude reporting transponders and non-controlled aircraft similarly equipped. One of these organizations stated that the enhanced conflict alert feature should be installed in the en route automation systems as soon as possible. Additionally, this organization stated that prior to the installation of the Advanced Automation Systems for approach control facilities, the FAA should also upgrade existing terminal automation systems with the enhanced conflict alert feature even if additional hardware has to be procured for this purpose.

On June 20, 1986, the FAA's Fort Worth Air Route Traffic Control Center began testing a computer software program designed to provide alerts to controllers concerning non-controlled aircraft that represent potential conflict to a controlled aircraft. This program will be included in all other ATC en route facilities by the fall of 1988. Additionally, the FAA's accelerated facilities enhancement program addressed above will also provide the software capacity and enhancements for similar features in existing terminal automation systems.

See and Avoid

Numerous commenters were concerned that pilots would become even more reliant on ATC to detect and avoid other traffic. Some of these commenters stated that the requirement to see and avoid other aircraft is a pilot responsibility and that as an alternative to the transponder requirement, see-and-avoid responsibilities should be reemphasized to pilots. An aviation organization claimed that FAA's statement that "the Mode C requirement

has no safety benefit unless one or both are air traffic controlled" implies that the resulting level of control provided by ATC as a result of this proposal will mislead VFR pilots into a false sense of security with respect to ATC separation services.

The FAA disagrees with the allegation that pilots flying in either a VFR or IFR environment would have less incentive to avoid potentially hazardous situations. Rather, the FAA is confident that pilots understand that regardless of whether an aircraft is non-controlled, operating under IFR, or operating under VFR and subject to ATC services, each pilot is responsible to see and avoid other aircraft. This principle is persistently emphasized through FAA-initiated programs designed to remind pilots of their roles in preventing midair collisions. Such programs include pilot certification training, flight safety publications, accident prevention seminars, pilot biennual reviews, raincheck programs, etc. Even though there is no regulatory requirement to attend such programs, the FAA believes that pilots now attend and would attend such training programs in order to obtain the skills necessary for flight in an ATC environment. Further, as a part of the implementation process for this final rule, the FAA intends to issue an advisory circular that will address the benefits of and the requirements for operating with transponders and automatic altitude reporting equipment.

Promoting Aviation

Several commenters felt that the FAA should concern itself with the promotion of aviation, which includes general aviation, and not what they claimed would be the elimination of most general aviation activity. According to one commenter, the general aviation industry is already in a prolonged slump and the proposed transponder requirement would only make it worse.

Further, some commenters felt that transponder requirements would cause many of the general aviation airports, flight schools, and aircraft repair shops within the affected airspace to go out of business. Some commenters were of the opinion that non-transponder aircraft would have to relocate.

While FAA does have a responsibility to encourage and foster the development of civil aeronautics and air commerce, it has a higher responsibility to provide the safest aviation system that is reasonably possible. The FAA believes that its responsibility to promote safety is met by the provisions being adopted under this rule. The equipment requirements of this rule allow for an orderly transition and make provision for those operators temporarily incapable of meeting the rule's requirements. Additionally, as mentioned earlier, this rule does not alter existing provisions for nonequipped aircraft whereby the operator may receive an authorization to conduct operations without the required equipment.

Collision Avoidance Systems

An aviation organization stated that the recent TCAS test would have been more effective and realistic had more aircraft been equipped with a transponder with Mode C.

While it might be true that a TCAS test conducted in areas where all aircraft are equipped with transponders with Mode C would be more realistic, the test did confirm that a pilot is more efficient in detecting and avoiding traffic when given an adequate advance alert. Nevertheless, the transponder requirements imposed by this rule are primarily intended to improve a controller's ability to detect aircraft that present a potential conflict for controlled aircraft. The FAA also recognizes the potential benefits associated with a TCAS equipment requirement and, as discussed above, has proposed a TCAS requirement for certain operators.

Other commenters stated that LORAN C is excellent for navigation and could be adapted for use as a collision avoidance system and that such adaptation should be developed by the FAA. Supporting this view, an aviation organization stated that recently developed LORAN C equipment can provide warning signals to aircraft operators when they are approaching specifically programmed airspace such as TCA's and restricted areas. Another organization stated that the FAA should promote an inexpensive, independent, and on-board proximity warning indicator that could aid pilots in their see-and-avoid responsibilities rather than trying to solve the midair collision potential problem with TCA's and new transponder equipment requirements.

The FAA recognizes the potential benefits of LORAN C equipment in regard to navigation. However, the FAA remains convinced that the transponder with Mode C provides the best possible means whereby controllers and pilots are better able to identify and correlate unknown aircraft operating in and around terminal airspace.

An aviation organization pointed out that approximately 45 percent of the near midair collisions (NMAC) reported over the last year have occurred in controlled airspace. Yet, this organization stated, the FAA is proposing to increase the NMAC exposure risk by increasing the volume of controlled airspace at those very locations where NMAC's are most concentrated—busy terminal areas. This organization stated that it believes that, statistically, the probability of a NMAC would be greater as a result of an unmanageable increase to the volume of controlled airspace (up to 100 percent in some areas).

The fact that NMAC's occur primarily in terminal airspace has little or nothing to do with the coincidence that this airspace is also designated as controlled airspace. One of the reasons NMAC's occur predominantly in terminal airspace is that a large volume of aircraft tend to concentrate at lower altitudes, in and around terminal airspace. Most significantly, the majority of the aircraft involved in NMAC's are non-controlled and unknown to ATC. The FAA envisions the Mode C requirement will significantly reduce the number of NMAC's between controlled and non-controlled aircraft operating in the affected airspace. The transponder with Mode C requirement, however, does not increase or affect in any manner the size of any controlled airspace.

Climb Corridors

An aviation organization, as well as other individual commenters, suggested that the FAA should seriously consider establishing arrival and departure corridors for primary airports that are currently in TCA's instead of continuing to establish and retain TCA's with existing designs. Numerous commenters agreed with this position, stating that the FAA should establish arrival and departure corridors for air carrier aircraft that would be similar to climb corridors now used by military aircraft. Additionally, they stated that such a design could provide a variety of benefits to air carrier aircraft as well as to pilots who want to avoid air carrier arrival and departure routes.

A simulation of the climb/descent corridor concept was conducted in the Boston, Massachusetts, area. One TCA and three corridor configurations were tested. The simulation revealed that, while the use of corridors did provide a degree of safety, these corridors cannot provide the required airspace to vector, sequence, and meter effectively the variety and numbers of aircraft that demand service at major terminal airports. Based on this evaluation, it was concluded that the use of corridors would result in a substantial loss in airport and airspace efficiency with a corresponding increase in arrival and

departure delays. This concept was more recently reviewed by the TCA Task Group and the group confirmed the earlier findings of the tests. Regardless, the FAA did not, under Notice Nos. 87–7 and 88–2, propose to change the physical dimensions of any TCA. Before such an action is formally proposed in a rulemaking action, the public will be given the opportunity to comment on, and in some cases, participate actively in the development of an airspace design or design modification.

Implementation

Several commenters stated that they believe there are not enough transponders now available to timely equip all aircraft that would be required to have them under this rule. An aviation organization stated that it objected to the compliance dates as it believed sufficient time is not allowed for aircraft owners to acquire and install required equipment or relocate the aircraft outside of the airspace where the equipment is required.

The compliance date of December 30, 1990, is mandated by statute. However, the FAA agrees that an effective date should be established that is consistent with, among other factors, the availability of the required equipment given the numbers of aircraft that need to be equipped. In this regard, the FAA has reviewed the numbers of affected aircraft and the present and future availability of required transponder equipment.

Using information furnished in the comments of various user organizations and others, and FAA's own statistical information (discussed in more detail below in the summary of the Regulatory Evaluation), the FAA has concluded that approximately 106,000 aircraft will be required to install all or a part of the equipment being required in this final rule. Of these 106,000 aircraft, approximately 72,000 will require the installation of the Mode C equipment only; the remaining aircraft (approximately 34,000) will require the installation of a transponder and the Mode C equipment.

Based on the foregoing, FAA estimates that there is a need for *106,000 encoders* and *34,000 transponders*. Further, the FAA conservatively estimates that half of this equipment will be required to facilitate compliance by July 1, 1989, and half by December 30, 1990. The following analysis of transponder and altitude encoder equipment production and installation is based on information received from the General Aviation Manufacturing Association (GAMA) in December 1987.

Current production of altitude encoders and transponders is estimated to be 1,800 and 600 per month respectively. Six months after publication of a final rule, GAMA estimated that these monthly production rates could double or triple. Based on a July 1, 1988, publication date of a final rule, and based on the number of transponders and encoders that are required, the FAA assumes that by January 1, 1989, production will have reached a triple-rate (5,400 encoders and 1,800 transponders per month).

Transponder and Encoder at Triple-Rate Production

Need by	Encoders	Transponders
7/01/89	53,000	17,000
12/30/90	106,000	34,000

Event	Date	Encoders	Transponders
Current production	12/01/87 thru 6/30/88	12,600	4,200
Final rule published	6/30/88		
Current production	7/01/88 thru 12/31/88	10,800	3,600
Begin triple-rate production	1/01/89		
Production from 1/01/89 to 07/01/89		32,400	10,800
Totals by 7/1/89		55,800	18,600
Production from 7/1/89 to 12/30/90		97,200	32,400
Totals by 12/30/90		153,000	51,000

Based on GAMA's predictions and assuming a triple-rate production, by July 1, 1989, there would be enough encoder and transponder equipment produced for every aircraft that is assumed to be affected. Further, the FAA has significantly reduced the amount of airspace that would have been affected by the proposals in Notice 88–2 to an amount that nonequipped aircraft, without a significant inconvenience, could circumnavigate affected airspace until the required equipment is acquired and/or installed.

Nevertheless, the FAA strongly advises aircraft owners/operators to begin purchasing and installing equipment immediately.

An aviation organization stated that the proposal does not clearly identify the effects on adjacent airspace, airports, operations, special-use airspace activities, and NAVAID's. One aviation organization stated that the proposed transponder equipment requirement is an attempt to improve safety by separating airspace from airspace when the FAA should be separating aircraft from aircraft.

The FAA, in this rule, is limiting the application of the transponder and Mode C requirement to airspace that is traversed by a significant number of controlled and non-controlled aircraft. Within this airspace, the FAA believes that as many aircraft as possible should be identifiable with regard to location and altitude. Having such information facilitates the reduction of the collision potential between controlled and non-controlled aircraft.

Additionally, many of these controlled aircraft will be equipped with TCAS which, as discussed earlier, is most effective when a potentially conflicting aircraft is equipped with the required transponder equipment.

Short Comment Periods

An aviation organization stated that the FAA showed a disregard for the airspace users it regulates by an inadequate public comment period in Notice No. 88–2. Many commenters were generally critical of the comment periods provided by the FAA, and requested extensions.

The FAA extended the comment period by 45 days. This extension was in response to requests from Members of Congress, an aviation association that it needed extra time in order to circularize the notice to its members, and others. The FAA is aware that many general aviation pilots receive notification of proposed rulemaking only through user organizations and, in these particular cases, noted that an extension of the

comment periods would not jeopardize the ability of the agency to reach final rulemaking action in a timely manner.

Helicopters

A national aviation association stated that there was no information provided in the Notice that would indicate that a problem exists with helicopters operating without the proper transponder equipment. In all cases today, these aircraft operate under letters of agreement with the appropriate ATC facility. This organization further stated that the regulatory evaluation is seriously flawed and failed to assess realistically the total costs necessary to equip commercial helicopters. This organization said that, typically, many helicopter operators already equip their aircraft with transponders with Mode C if their operations routinely use TCA airspace. Other operators do not equip their fleets with such equipment simply because there is no need; e.g., local flight training or agricultural operations. Additionally, many smaller helicopters do not have a place on the instrument panel for the installation of transponders and the added weight poses a penalty in the form of a reduced useful load.

Helicopters no longer represent a small percentage of the aircraft operating in busy terminal areas nor are they limited by operational capability with respect to flight within these areas, which was the rationale applied to their original exclusion in § 91.24. Their versatility has brought about a significant rise in operations in and around busy metropolitan areas, particularly those where TCA's and ARSA's exist. The FAA believes that helicopters must be treated in the same manner as any other aircraft. Also, the congressional mandate referred to all aircraft, with no provision for a categorical exclusion of helicopters. The need for safety, especially since a significant number of travelers will be transported from airports in busy terminal areas (i.e., inter-city transport) to other areas, argues against the contention that helicopters should be viewed as "special applications" type aircraft.

Charting

An aviation organization stated that charting of the transponder with Mode C requirement areas is necessary so that pilots of aircraft without the required equipment can readily avoid them as necessary.

The FAA believes that most aircraft owners/operators will voluntarily equip their aircraft with the required transponders with Mode C rather than avoid the airspace with the requirement. With the required equipment on the aircraft, pilots have more flexibility in planning their flights than those in nonequipped aircraft. However, in the interest of providing assistance to those nonequipped aircraft to avoid areas where a transponder with Mode C is being required, the FAA will ensure that appropriate charting changes are implemented.

Ultralights

Many commenters, including those who addressed their comments to Members of Congress, expressed concern that the proposals would require transponders with Mode C equipment on ultralight vehicles.

The FAA, in Notice Nos. 87–7 and 88–2, did not propose to impose any new transponder requirement on ultralight vehicles and the final rule adopted herein does not impose such a requirement.

Federalism Determination

The amendment set forth herein would not have substantial direct effects on the states, on the relationship between the national government and the states, or on the distribution of power and responsibilities among the various levels of government. The regulations set forth in this notice would be promulgated pursuant to the authority in the Federal Aviation Act of 1958, as amended (49 U.S.C. 1301, *et seq.*), which has been construed to preempt state law regulating the same subject. Therefore, in accordance with Executive Order 12612, it is determined that such a regulation does not have federalism implications warranting the preparation of a Federalism Assessment.

Regulatory Evaluation Summary

Benefit-Cost Analysis

The regulatory evaluation prepared for this final rule examines the cost and benefit aspects of expanding the existing transponder with Mode C requirement. This rule amends Part 91 of the FAR by requiring an aircraft to be equipped with a transponder with Mode C when operating in the vicinity of certain airports for which terminal radar approach control service area has been established, and in other non-terminal airspace at the above 10,000 feet MSL.

Implementation of this rule will be accomplished in two phases. Phase I will require a transponder with Mode C for most aircraft operations in the airspace at the above 10,000 MSL, and in the vicinity of TCA primary airports.

Phase II will require a transponder with Mode C for most operations in the vicinity of ARSA primary airports and other designated airports.

The FAA believes these actions are necessary in order to reduce the potential for midair collisions between controlled or TCAS-equipped aircraft and non-controlled aircraft. Similar safety concerns have been expressed by members of Congress, user associations, and national safety organizations.

Costs

The FAA estimates the total cost of compliance expected to accrue from implementation of this rule to be $140 million (discounted in 1987 dollars), between 1989 and 1998. This cost of compliance estimate includes acquisition and installation of an electrical system in some aircraft and maintenance of the required transponder and Mode C equipment. The derivation of this cost estimate and the assumptions on which it is based are discussed below.

Based on the informed judgment of FAA personnel and information contained in the FAA report entitled, "General Aviation Activity and Avionics Survey (December 1987)," this rule is expected primarily to impact single-engine (piston) airplanes and some rotorcraft. This evaluation assumes a worst-case scenario that all operators of general aviation aircraft without a transponder with Mode C will acquire such equipment, excluding most aircraft without electrical systems. Virtually all operators of aircraft constructed without the capability for an electrical system are not expected to be significantly impacted by this rule because of the airspace exclusions being adopted in this rule. In addition, other types of general aviation fixed-wing airplanes, which include twin-engine (piston), turbojets, and turboprops will not be impacted by this rule because virtually all of them are already equipped with a transponder with Mode C, based on the subject report.

Based on equipment cost data obtained from industry sources for transponder and altitude encoding equipment that is likely to be installed on the number of impacted reciprocating single-engine airplanes and rotorcraft, the FAA estimates that these aircraft operators will likely incur a one-time acquisition and installation cost ranging between $900 and $2,000, depending on whether or not they have a transponder or transponder with Mode C.

According to the above avionics survey report, there are an estimated 39,361 single-engine aircraft that are not

equipped with a transponder. Of these aircraft, the FAA estimates that 19,681 and 19,680 will be impacted in implementation, respectively, in Phases I and II of this rule. The cost of compliance for these operators can be determined by multiplying the number of aircraft without any transponder in Phases I and II by $2,000. This computation amounts to an estimated $36 million (discounted) in Phase I and $33 million (discounted) in Phase II, in 1987 dollars.

The above avionics report also revealed there are an estimated 64,657 aircraft currently being operated with a transponder having no Mode C capability. These aircraft will likely be impacted by this rule. Among these aircraft, approximately 32,329 will be impacted in Phase I and 32,328 in Phase II. The estimated cost of compliance for these aircraft operators can be determined by multiplying these numbers of aircraft by $900. This computation amounts to an estimated $26 million (discounted) in Phase I and $24 million (discounted) in Phase II, in 1987 dollars.

This rule will impose an additional cost component for transponder maintenance. The cost estimate for maintenance can be determined by multiplying the undiscounted costs in Phase I ($69 million) and Phase II ($68 million) for aircraft with a transponder without Mode C and aircraft with no transponders by 5 percent, which amounts to $3.4 million biennually in each phase (transponder maintenance is required biennually under § 91.172, ATC transponder tests and inspection). After discounting $6.8 million, biennually, over a 10-year period this computation results in an estimated maintenace costs of $10 million (discounted) in Phase I and $8 million (discounted) in Phase II, in 1987 dollars.

Some of those aircraft operators without transponders are expected to incur additional costs to acquire and install an electrical system. Based largely on cost information received in the comments to Notice 88–2, the average number of general aviation aircraft without an electrical system is estimated to be 27,000. Some comments indicated an average cost estimate of $4,000 to acquire and install such a system. For reasons explained earlier, it is estimated that only 1,000 of these aircraft will be impacted by this rule. An estimated 500 of these aircraft will be impacted in each of the two phases. Therefore, multiplying the figures of 500 by $4,000 results in estimated cost of $1.8 million (discounted) in Phase I and $1.6 million (discounted) in Phase II, in 1987 dollars.

The total cost of compliance amounts to an estimated $140 million (discounted, in 1987 dollars), between 1989 and 1998. Phase I is expected to account for an estimated $74 million (or 53 percent) of this cost estimate, while Phase II captures the remainder.

Benefits

This rule is expected to generate potential benefits primarily in the form of enhanced safety to the aviation community and flying public. Such safety, for instance, will take the form of reduced likelihood of midair collisions.

This rule will require a transponder with Mode C for most aircraft operations within 30 nautical miles of any designated TCA primary airport and generally within 10 nautical miles of an ARSA or other high-passenger-traffic airport designated in this rule. The FAA believes that the adoption of this expanded transponder with Mode C requirement will immediately help to reduce the potential for midair collisions. For example, the continuous display of altitude information on ATC radar scopes assists controllers in separating aircraft. It provides the requisite information to the ATC computer to provide a controller with an alert in the event of a potential conflict between controlled aircraft. The FAA plans to expand this alert feature to provide a similar alert in situations involving potential conflicts between controlled and non-controlled aircraft. Additionally, an environment within which nearly all aircraft are equipped with a transponder with Mode C is essential to allow TCAS-equipped aircraft to function as intended to avert potential midair collisions with other aircraft.

It is difficult to determine the prospective reduction in casualty loss that this rule will provide. Some insight can be gained by examining the historical record of accidents. An examination of the National Transportation Safety Board (NTSB) data base revealed that over 50 midair collisions have occurred in the U.S. over the past 5 to 10 years, including two within TCA's (San Diego, California in 1978 and Cerritos, California in 1986) that involved air carriers. For air carriers, this equates to a rate of two fatal midair collisions every 10 years. For the purpose of analysis, the FAA has used a minimum statistical value of each fatality prevented of $1 million. For midair collisions involving air carriers, the annual loss is estimated at $28 million (or $172 million discounted over 10 years). For midair collisions involving commuters or air taxis (Part 135 operations), the annual loss is estimated at $16 million (or $98 million discounted over 10 years). In addition, for general aviation aircraft the annual loss is estimated at $19 million (or $117 million discounted over 10 years). The FAA does not know with certainty to what extent this rule will help to reduce the probability of future midair collisions. This assessment is based on the fact that midair collisions are random events. Such events cannot be predicted with a reliable degree of certainty based on past events. For this reason, it is difficult to predict the frequency and magnitude of casualty losses associated with future midair collisions. Nonetheless, for the purpose of this evaluation, the midair collision data obtained from the NTSB will serve as the FAA's best indication of potential magnitude and frequency of future midair collisions in the U.S. over the next 10 years, with one exception. Unlike general aviation aircraft, midair collisions involving air carriers are not only random but they are rare. Thus, it is not prudent to assume that the likelihood of an equal number of fatal midair collisions will take place over the next 10 years. For this reason, a Poisson distribution has been used to estimate the probability of experiencing two or more random midair collisions over the next 10 years. The Poisson distribution indicates there is a 60 percent probability of such midair collisions occurring over the next 10 years. Multiplying this probability by the cost of two potential midair collisions ($256 million), results in an expected value of potential benefits of $154 million. Discounted over the next 10 years results in potential benefits of $95 million. This estimate, along with those for commuters and general aviation aircraft, amounts to a total potential benefits estimate of $310 million (discounted in 1987 dollars).

The FAA believes there is a high likelihood that a number of these potential fatal midair collisions can be avoided over the next 10 years, although this may not be attributed solely to this rule. In fact, there is a greater tendency for such accidents to occur over the next 5 years (1989–1993) than thereafter because of the numerous aviation safety measures that have been adopted by the FAA in the past and those presently proposed with full effectiveness expected by 1993. For example, FAA Notice 87–8 (TCAS) is expected to reduce significantly the likelihood of midair collisions as early as next year and thereafter.

Conclusions

While the cost of compliance estimate of $140 million (discounted) associated with this rule involves some uncertainty, the estimate of potential benefits of $310 million (discounted) contains more uncertainty. Most of this uncertainty is due to the belief that some of this rule's effectiveness in the future will be attributed to the combined benefits from the TCAS proposal and transponder with Mode C equipment. Not knowing what increased benefit the TCAS proposal will have on this rule's effectiveness affects the extent to which the benefits figure of $310 million can be confidently attributed to this rule. I.e., the benefits of this final rule and the TCAS proposal are inextricably linked and cannot be determined separately at this time. Nonetheless, the FAA firmly believes this final rule, standing alone, is cost-beneficial.

The Regulatory Evaluation that has been placed in the costs and benefits that are expected to accrue from the implementation of this rule.

International Trade Impact Assessment

This rule will have no effect on the sale of foreign aviation products or services in the United States, nor will it affect the sale of United States products or services in foreign countries. This is because the rule being adopted herein will only impact operators of aircraft not equipped with a transponder with Mode C. Virtually all foreign aircraft are believed to be equipped with a transponder with Mode C.

Regulatory Flexibility Determination

The Regulatory Flexibility Act of 1980 (RFA) was enacted by Congress to ensure that small entities are not unnecessarily and disproportionately burdened by government regulations. The RFA requires agencies to review rules which may have "a significant cost impact on a substantial number of small entities." The small entities that could be potentially affected by the implementation of this rule are primarily air taxi operators, fixed based operators, and small airports.

The Initial Regulatory Flexibility Analysis published in the Notice 87-7 indicated that the then proposed rule would not have a significant economic impact on a substantial number of small entities. This initial analysis indicated that the proposals would not affect the operations or impose any costs on the individual flight schools and flying clubs because their student training activities would not be impacted. However, several types of small business were not addressed in the initial analysis. These included aerial advertising, aerial agriculture and pest control, and fixed base operators that offer services and goods. Those businesses in aerial agriculture or in aerial advertising will not incur a significant impact since the required transponder with Mode C equipment is relatively inexpensive. Fixed base operators may be impacted significantly since some of the aircraft based at some airports may choose to move. This may also affect some small airports, though it is less likely to occur under this rule because of its more restrictive nature due to the imposition of a transponder with Mode C requirement at ARSA and other designated airport locations. Nevertheless, from a conservative standpoint, the FAA will consider the potential cost impacts on fixed based operators and small airports. However, since the annualized cost for a Mode C transponder is only about $300 over a 10-year period, Part 135 operators would not be impacted significantly. Accordingly, the FAA believes that the comments did indicate that there would be a significant economic impact on a substantial number of small entities. Therefore, the following final regulatory flexibility analysis is presented in compliance with section 604(a) of the Regulatory Flexibility Act.

Public Comments in Response to the Initial Regulatory Flexibility Analysis

There were numerous comments related to the initial regulatory flexibility determination contained in Notice 87-7. The vast majority of those comments indicated that the proposal would cause undue hardships on small businesses.

There were many comments from private airports, state aviation organizations, and private trade associations which indicated there would be significant economic impact to private and public airports as well as fixed base operators operating at those airports. For example, one private airport operator estimated that he would lose up to 50 percent of the aviation activity at his airport. Many businesses engaged in aerial agriculture and pest control and in aerial advertising indicated that the proposed rules would have significant economic impact.

Description of Significant Alternatives

Alternative One—Delay Implementation for a Longer Period

This alternative would enable the supply of avionics to be in better balance with demand and, therefore, the cost should be less. In addition it will allow the operator to equip at the most propitious time as well as to optionally equip with Mode S.

The FAA believes there is merit in this alternative. However, the safety need is such that at a time certain for compliance should be established and the FAA has selected two phases for implementation. The first phase requires a transponder with Mode C transponder on most aircraft operating within 30 nautical miles of a TCA by July 1, 1989. The second phase requires a transponder with Mode C on most aircraft operating in the vicinity of an ARSA and other designated airports by December 1, 1990 (approximately one and a half years after phase I).

Alternative Two—Have Different Standards for Small Businesses

This alternative would save the small firm the compliance cost of this rule. The FAA has rejected this approach because it is contrary to the statute, inequitable to the individual owner operator, and safety would be derogated.

Alternative Three—Design the Airspace to Minimized Impact

This alternative would exclude more airspace within the affected areas from the transponder with Mode C requirement, saving the user the cost of the avionics. The FAA has rejected this because it is contrary to the statute and falls short of the projected safety benefits provided in the rule being adopted.

The Rule

For the reasons stated above, the FAA is substantially adopting the Mode C proposal contained in Notice 87-7 with certain exclusions, and modifying the transponder with Mode C proposals contained in Notice 88-2. The following is a discussion of the regulatory changes contained in this final rule:

Transponder with Mode C Requirement

Vicinity of TCA's

Effective July 1, 1989, all aircraft are required to have a transponder with Mode C when operating within 30 miles of any designated TCA primary airport from the surface to the 10,000 feet MSL. Aircraft which were not originally certificated with an engine-driven electrical system or which have not subsequently been certified with such a system installed, balloons, and gliders are excluded from this requirement when conducting operations below the altitude of the ceiling of a TCA or 10,000 feet MSL, whichever is lower, and outside any airspace in which a transponder with Mode C is otherwise required. This requirement would also

apply on the effective date of any future designated TCA primary airport. TCA primary airports are designated by rulemaking actions associated with the establishment or modification of a TCA. Limited deviation from this requirement may be permitted on a case-by-case basis by authorization under existing regulations.

Vicinity of ARSA's

Effective December 30, 1990, all aircraft operating in an ARSA and in all airspace above an ARSA beginning at the ceiling of that ARSA and extending upward to 10,000 feet MSL within the lateral confines of that ARSA must be equipped with an operable transponder with Mode C. The requirement would also apply on the effective date of any future designated ARSA. Aircraft operating in the airspace beneath an ARSA are not required to have a transponder with Mode C. Limited deviation from this requirement may be permitted on a case-by-case basis by authorization under existing regulations.

Vicinity of Other High-Passenger-Traffic Airports

Effective December 30, 1990, aircraft operating in the airspace from the surface to 10,000 feet MSL within a 10-mile radius of any airport listed in newly designated Appendix D of Part 91 must be equipped with an operable transponder with Mode C except when operating in the airspace below 1,200 feet AGL outside of the ATA. Currently, Logan International Airport, Billings, MT; and Hector International Airport, Fargo, ND; are the only airports listed. Aircraft which were not originally certificated with an engine-driven electrical system or which have not subsequently been certified with such a system installed, balloons, and gliders are excluded from this requirement. Other aircraft may be granted authorization to deviate from this requirement under existing regulations.

Vicinity of Other Airports

At other airports where terminal radar service is provided, operators are subject to the existing requirement that pilots of aircraft with a transponder with a Mode C must operate that equipment while in controlled airspace. The rule adopted does not alter that requirement.

En Route Airspace

Effective July 1, 1989, aircraft operating in all airspace of the 48 contiguous States and the District of Columbia at and above 10,000 feet MSL must be equipped with an operable transponder with Mode C except when operating at and below 2,500 feet AGL. Aircraft which were not originally certificated with an engine-driven electrical system or which have not subsequently been certified with such a system installed, balloons, and gliders are excluded from the transponder requirement when operating beneath the floor of a PCA (below 18,000 feet MSL) provided such operation is not conducted in any ARSA, TCA, or other airspace requiring the equipment. The exclusion of gliders from the en route airspace requirement continues the existing provisions for glider operations up to but not including 18,000 feet MSL. The similar exclusion for other aircraft which were not originally certificated with an engine-driven electrical system or which have not subsequently been certified with such a system installed and balloons permits such operations between 10,000 feet MSL and 18,000 feet MSL without a waiver or authorization, as is currently required. However, the number of operations by such aircraft at these altitudes is expected to be negligible. Other nonequipped aircraft may obtain authorization to conduct operations without the required equipment under existing regulations.

Editorial Changes to TCA and ARSA Requirements

By adopting an expanded requirement for a transponder with Mode C in this final rule, a transponder is required with stated exceptions within a 30-mile radius of any Group I, II, or III TCA. This action effectively cancels the provisions contained in § 91.90 for Group III TCA's. Since a Group III TCA has never been designated, the provisions for such TCA's are revoked in this final rule. Additionally, § 91.90 is amended to reflect Amendment No. 91–198 (52 FR 3391; February 3, 1987) which imposed the Group I TCA transponder with Mode requirement in Group II TCA's. However, Notice 87–7 addressed the issue of a single-class TCA; therefore, Group I and II TCA's are retained pending a final disposition of that notice. Additionally, § 91.88 is amended to reflect the adoption of the transponder with Mode C requirement for operations in an ARSA.

These amendments to §§ 91.90 and 91.88 are limited to those necessary for consistency with the revised transponder with Mode C requirements in § 91.24.

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Appendix

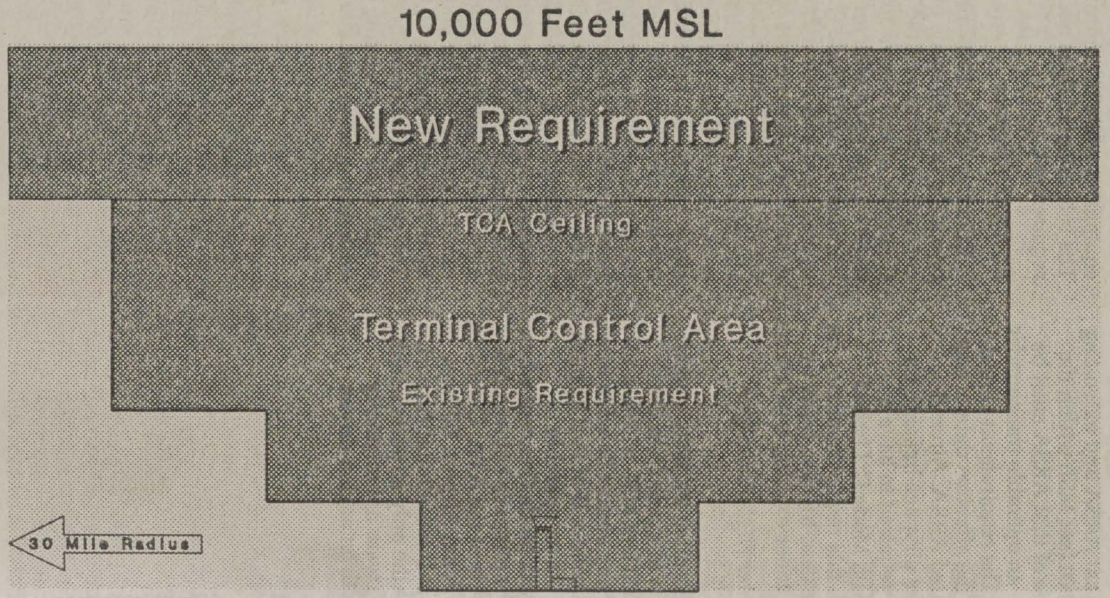
Note.—This appendix will not appear in the Code of Federal Regulations.

Mode C Transponder
Terminal Control Area Requirement

Within 30 Miles of a TCA Primary Airport Unless Otherwise authorized by ATC

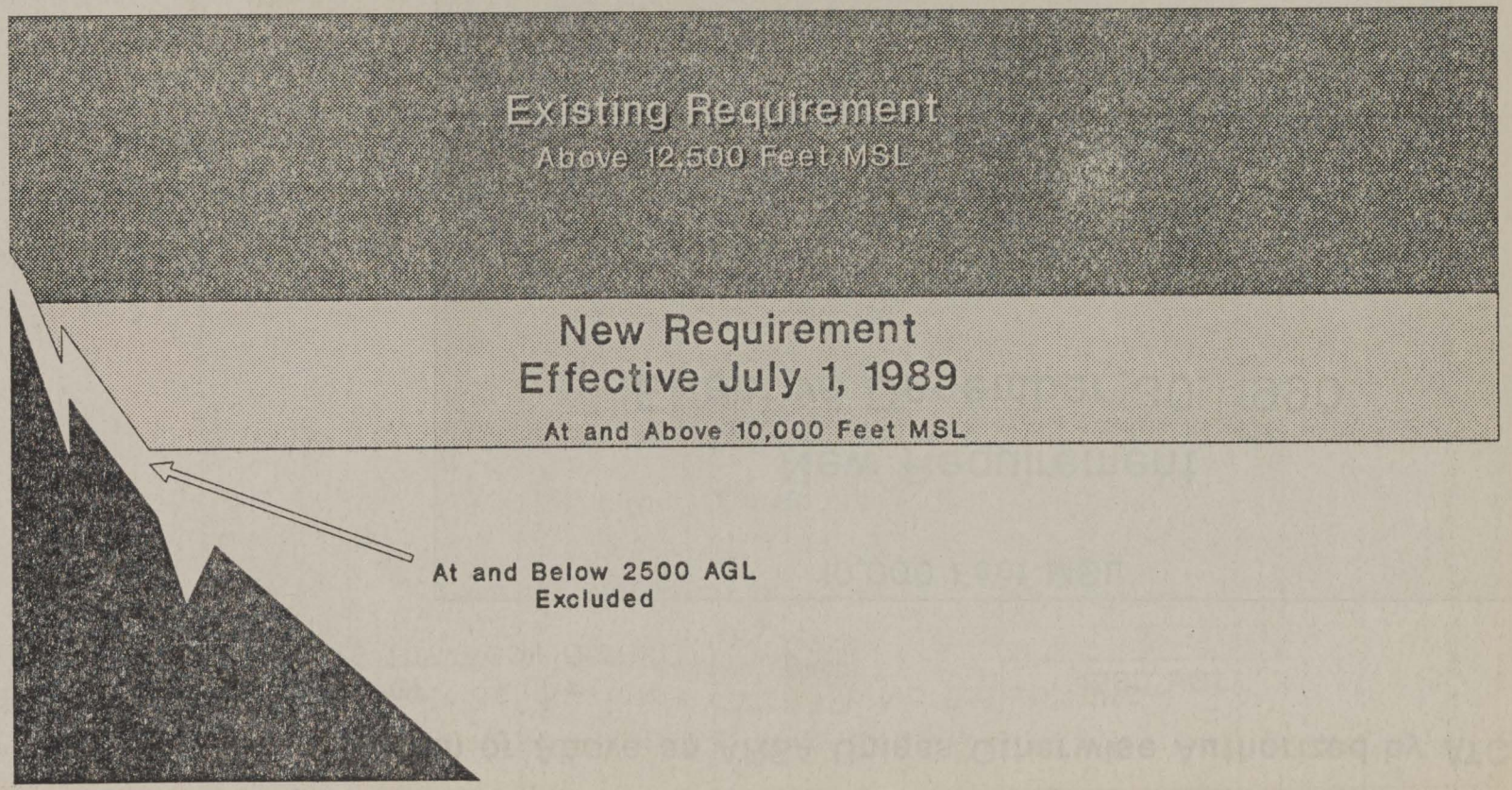
Aircraft Without Electrical Systems Are Exceptions to the Requirement

No Exceptions



Mode C Transponder Enroute Requirement

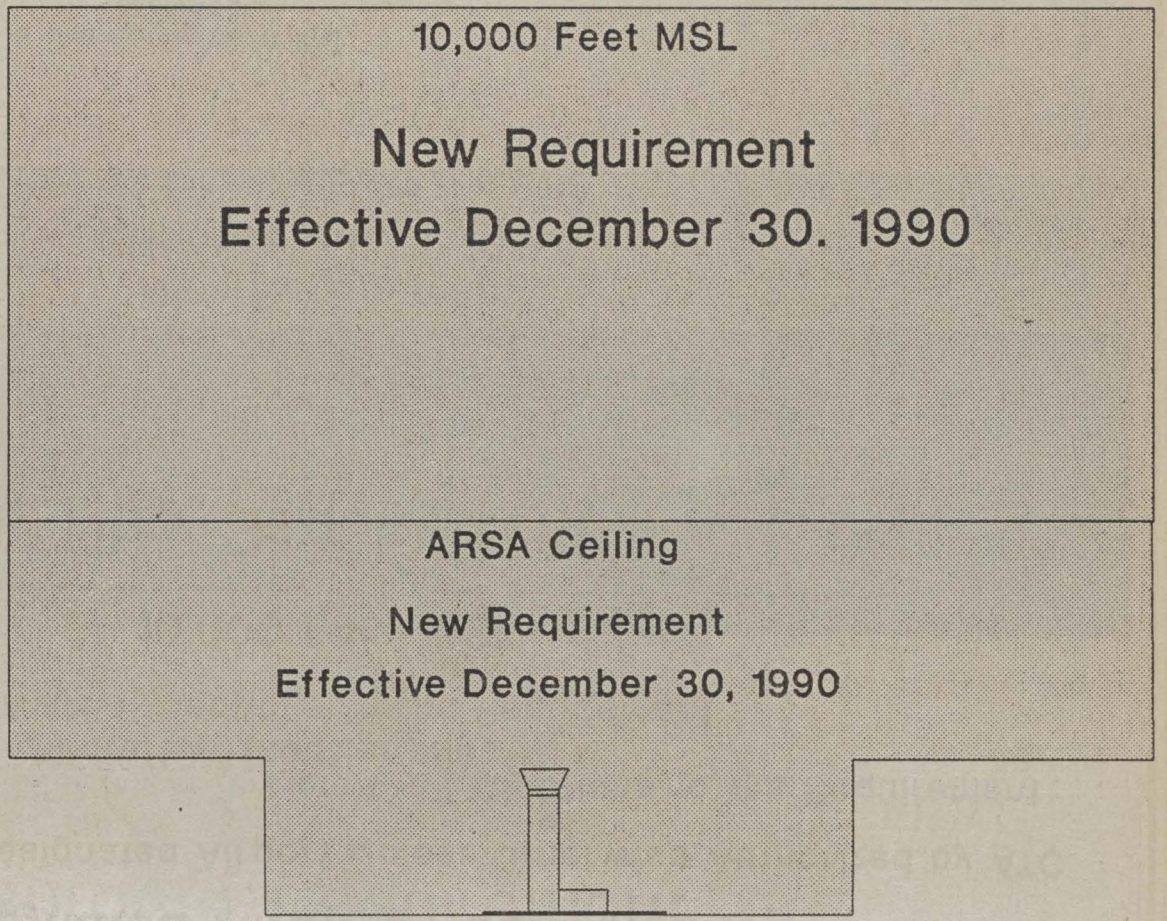
Aircraft Without an Electrical System Are Exceptions to the Requirement



Mode C Transponder

Airport Radar Service Area Requirement

Within or Above an ARSA Unless Otherwise Authorized by ATC

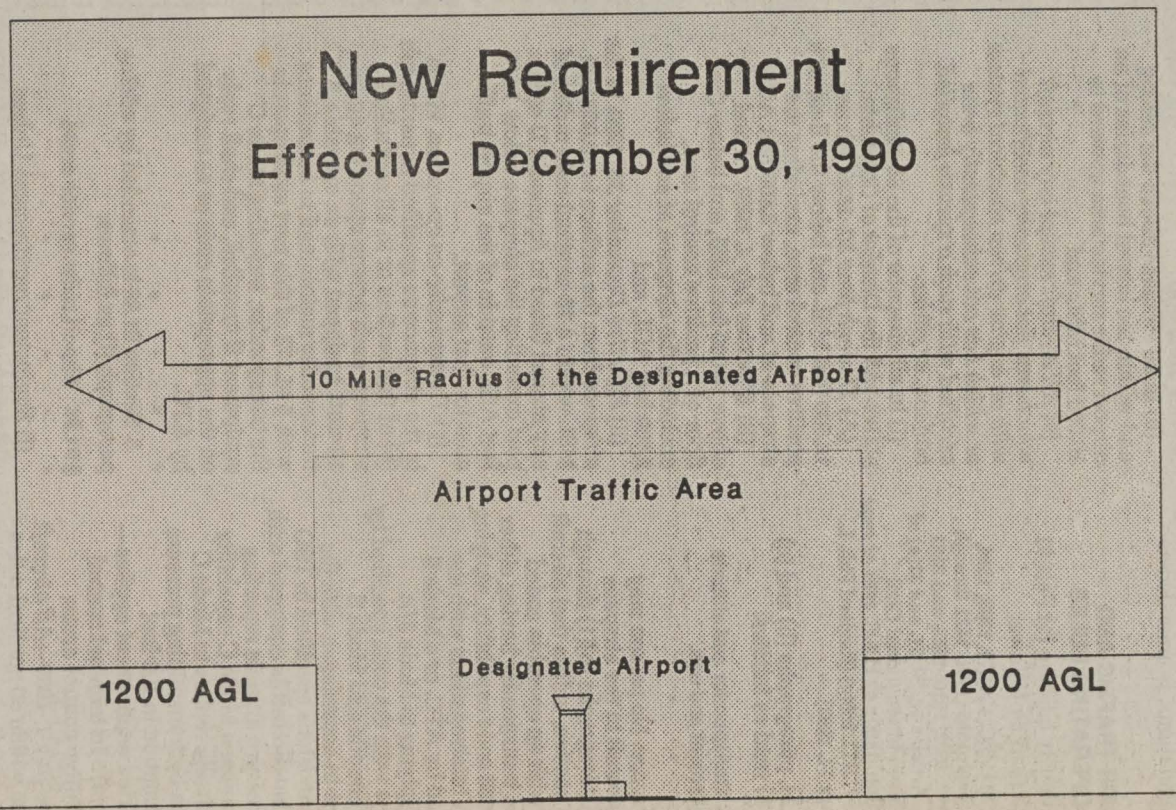


Mode C Transponder
Designated Airport Requirement

Within 10 Miles of a Designated Airport Unless Otherwise Authorized by ATC

Aircraft Without an Electrical
System are Exceptions to the Requirement

10,000 Feet MSL



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List of Subjects in 14 CFR Part 91

Aviation safety, Safety, Aircraft, Air traffic control, Pilots, Airspace, Air transportation, and Airports.

Adoption of the Amendments

For the reasons set forth in the preamble, Part 91 of the Federal Aviation Regulations, is amended as follows:

PART 91—AIR TRAFFIC AND GENERAL OPERATING RULES

1. The authority citation for Part 91 continues to read as follows:

Authority: 49 U.S.C. 1301(7), 1303, 1344, 1348, 1352 through 1355, 1401, 1421 through 1431, 1471, 1472, 1502, 1510, 1522, and 2121 through 2125; Articles 12, 29, 31, and 31(a) of the Convention on International Civil Aviation (61 Stat. 1180); 42 U.S.C. 4321 *et seq.*; E.O. 11514; 49 U.S.C. 106(g) (Revised Pub. L. 97–449, January 12, 1983).

2. In § 91.24, paragraphs (b) and (c) are revised to read as follows:

§ 91.24 ATC Transponder and altitude reporting equipment and use.

* * * * *

(b) *All airspace.* No person may operate an aircraft in the airspace described in paragraphs (b)(1) through (b)(5) of this section, unless that aircraft is equipped with an operable coded radar beacon transponder having either Mode 3/A 4096 code capability, replying to Mode 3/A interrogations with the code specified by ATC, or a Mode S capability, replying to Mode 3/A interrogations with the code specified by ATC and intermode and Mode S interrogations in accordance with the applicable provisions specified in TSO C–112, and that aircraft is equipped with automatic pressure altitude reporting equipment having a Mode C capability that automatically replies to Mode C interrogations by transmitting pressure altitude information in 100-foot increments. This requirement applies—

(1) *All aircraft.* In terminal control areas and positive control areas;

(2) *Effective July 1, 1989—All aircraft.* In all airspace within 30 nautical miles of a terminal control area primary airport, from the surface upward to 10,000 feet MSL;

(3) *Effective July 1, 1989.* Notwithstanding paragraph (b)(2) of this section, any aircraft which was not originally certificated with an engine-driven electrical system or which has not subsequently been certified with such a system installed, balloon, or glider may conduct operations in the airspace within 30 nautical miles of a terminal control area primary airport provided such operations are conducted—

(i) Outside any terminal control area and positive control area; and

(ii) Below the altitude of the terminal control area ceiling or 10,000 feet MSL, whichever is lower; and

(4) *Effective December 30, 1990—All aircraft.*

(i) In the airspace of an airport radar service area, and

(ii) In all airspace above the ceiling and within the lateral boundaries of an airport radar service area upward to 10,000 feet MSL; and

(5) *All aircraft except any aircraft which was not originally certificated with an engine-driven electrical system or which has not subsequently been certified with such a system installed, balloon, or glider.*

(i) In all airspace of the 48 contiguous states and the District of Columbia:

(A) *Through June 30, 1989.* Above 12,500 feet MSL and below the floor of a positive control area, excluding the airspace at and below 2,500 feet AGL.

(B) *Effective July 1, 1989.* At and above 10,000 feet MSL and below the floor of a positive control area, excluding the airspace at and below 2,500 feet AGL; and

(ii) *Effective December 30, 1990.* In the airspace from the surface to 10,000 feet MSL within a 10-nautical-mile radius of any airport listed in Appendix D of this part excluding the airspace below 1,200 feet AGL outside of the airport traffic area for that airport.

(c) *Transponder-on operation.* While in the airspace as specified in paragraph (b) of this section or in all controlled airspace, each person operating an aircraft equipped with an operable ATC transponder maintained in accordance with § 91.172 of this part shall operate the transponder, including Mode C equipment if installed, and shall reply on the appropriate code or as assigned by ATC.

* * * * *

3. Section 91.88 is amended by adding paragraph (f) as follows:

§ 91.88 Airport radar service areas.

* * * * *

(f) *Equipment requirement.* Unless otherwise authorized by ATC, no person may operate an aircraft within an airport radar service area unless that aircraft is equipped with the applicable equipment specified in § 91.24.

5. Section 91.90 is revised to read as follows:

§ 91.90 Terminal control areas.

(a) *Group I and II terminal control area operating rules.* No person may operate an aircraft within a terminal control area designated in Part 71 of this chapter except in compliance with the following rules:

(1) No person may operate an aircraft within a terminal control area unless that person has received an appropriate authorization from ATC prior to operation of that aircraft in that area.

(2) Unless otherwise authorized by ATC, each person operating a large turbine engine-powered airplane to or from a primary airport shall operate at or above the designated floors while within the lateral limits of the terminal control area.

(b) *Group I terminal control area pilot requirements.* (1) The pilot in command of any civil aircraft conducting take off and landing operations at an airport within any terminal control area listed in paragraph (b)(2) below must hold at least a private pilot certificate.

(2) *List of terminal control areas.*

(i) Atlanta, GA.

(ii) Boston, MA.

(iii) Chicago, IL.

(iv) Dallas, TX.

(v) Los Angeles, CA.

(vi) Miami, FL.

(vii) New York, NY.

(viii) San Francisco, CA.

(ix) Washington, DC.

(c) *Group I and II terminal control area communications and navigation equipment requirements.* Unless otherwise authorized by ATC in the case of inflight VOR, TACAN, or two-way radio failure, no person may operate an aircraft within a terminal control area unless that aircraft is equipped with an operable VOR or TACAN receiver (except for helicopters) and an operable two-way radio capable of communications with ATC on appropriate frequencies for that terminal control area.

(d) *Group I and II terminal control area transponder requirement.* No person may operate an aircraft in a terminal control area without the applicable transponder and automatic altitude reporting equipment specified in paragraph (a) of § 91.24 except as provided for in paragraph (d) of that section.

6. In Part 91, Appendix D is added as follows:

Appendix D—Airports/Locations Where the Transponder Requirements of Section 91.24(b)(4)(ii) Apply

Section 1. The requirements of § 91.24(b)(4)(ii) apply to operations in the vicinity of each of the following airports.

Logan International Airport, Billings MT.
Hector International Airport, Fargo, ND.

Issued in Washington, DC, on June 17, 1988.

T. Allan McArtor,

Administrator.

[FR Doc. 88–14065 Filed 6–17–88; 3:40 pm]

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